Naval Education and Training Command

NAVEDTRA 72540
January 1994
0503-LP-477-8900

Nonresident Training Course (NRTC)

Engineering Aid 2

Only one answer sheet is included in the NRTC. Reproduce the required number of sheets you need or get answer sheets from your ESO or designated officer.

0503LP4778900

Although the words “he,” “him,” and “his” are used sparingly in this manual to enhance communicantion, they are not intended to be gender driven nor to affront or discriminate against anyone reading this material.

COMMANDING OFFICER
NETPDTC
6490 SAUFLEY FIELD RD
PENSACOLA, FL 32509-5237

ERRATA #2 2 Nov 1999
Stock Ordering No.
0503-LP-477-8902

Specific Instructions and Errata for
Nonresident Training Course

ENGINEERING AID 2, NAVEDTRA 72540

1. No attempt has been made to issue corrections for errors in typing, punctuation, etc., that do not affect your ability to answer the question or questions.

2. To receive credit for deleted questions, show this errata to your local course administrator (ESO/scorer). The local course administrator is directed to correct the course and the answer key by indicating the question deleted.

3. Assignment Booklet, NAVEDTRA 72540

DELETE the following questions and leave the corresponding spaces blank on the answer sheet:

Question

5-12
6-58
8-9
8-27
8-30
9-26
9-27
9-63
10-52
10-67
10-68
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ENGINEERING AID 2

NAVEDTRA 72540

Prepared by the Naval Education and Training Program Management
Support Activity, Pensacola, Florida

Congratulations! By enrolling in this course, you have demonstrated a desire to improve yourself and the Navy. Remember, however, this self-study course is only one part of the total Navy training program. Practical experience, schools, selected reading, and your desire to succeed are also necessary to successfully round out a fully meaningful training program. You have taken an important step in self-improvement. Keep up the good work.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

ERRATA: If an errata comes with this course, make all indicated changes or corrections before you start any assignment. Do not change or correct the Training Manual (TRAMAN) or assignments in any other way.

TEXTBOOK ASSIGNMENTS: The TRAMAN for this course is *Engineering Aid Intermediate /Advanced,* NAVEDTRA 12540. The TRAMAN pages that you are to study are listed at the beginning of each assignment. Study these pages carefully before attempting to answer the questions in the course. Pay close attention to tables and illustrations because they contain information that will help you understand the text. Read the learning objectives provided at the beginning of each chapter or topic in the text and/or preceding each set of questions in the course. Learning objectives state what you should be able to do after studying the material. Answering the questions correctly helps you accomplish the objectives.

BLACK DOT INFORMATION: Black dots (●) may be used in the text and correspondence course to emphasize important or supplemental information and to highlight Instructions for answering certain questions. Read these black dot entries carefully; they will help you answer the questions and understand the material.

SELECTING YOUR ANSWERS: After studying the TRAMAN, you should be ready to answer the questions in the assignment. Read each question carefully, then select the BEST answer. Be sure to select your answer from the subject matter in the TRAMAN. You may refer freely to the TRAMAN and seek advice and information from others on problems that may arise in the course. However, the answers must be the result of your own work and decisions. You are prohibited from referring to or copying the answers of others and from giving answers to anyone else taking the same course. Failure to follow these rules can result in suspension from the course and disciplinary action.

SUBMITTING COMPLETED ANSWER SHEETS: Complete all assignments as quickly as possible to derive maxium benefit from the course. As a minimum, you must submit at least one assignment per month. This is a requirement established by the Chief of Naval Education and Training. Failure to meet this requirement could result In disenrollment from the course.

TYPES OF ANSWER SHEETS: If you are a U.S. Navy enlisted member on active duty or a drilling U.S. Naval Reserve enlisted member, you should use the answer sheet attached at the end of this course and follow the instructions in section A below. If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling unit or if you are an officer, a civilian, or a member of the U.S. Amy, Air Force, Marine Corps, or Coast Guard. you should use the Automatic Data Processing (ADP) answer sheets included in the course package and follow the instructions in section B.

A. **Manually Scored Answer Sheets**

If you are a U.S. Navy enlisted member on active duty or attached to a U.S. Naval Reserve drilling unit, your course will be administered by your local command. You must use the answer sheet designed for

manual scoring. NETPMSA form 1430/5, Stock Ordering Number 0502-LP-216-0100. You may get a supply of the forms from your Educational Services Officer (ESO), or you may reproduce the one in the back of this course booklet. DO NOT USE THIS FORM FOR COURSES ADMINISTERED BY NETPMSA.

Recording Information on the Manually Scored Answer Sheets: As you complete each assignment, submit the completed answer sheet to your ESO for grading. You may submit more than one answer sheet at a time. Remember, you must submit at least one assignment each month.

Grading: Your ESO will grade each answer sheet and notify you of any incorrect answers. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, the ESO will list the questions you answered incorrectly and give you an answer sheet marked "RESUBMIT." You must redo the assignment and complete the RESUBMIT answer sheet. The maximum score you can receive for a resubmitted assignment is 3.2.

Course Completion: After you have submitted all the answer sheets and have earned at least 3.2 on each assignment, your command should give you credit for this course by making the appropriate entry in your service record.

Student Questions: If you have questions concerning the administration of this course, consult your ESO.

B. ADP Answer Sheets

If you are an enlisted U.S. Naval Reserve member who is not attached to a drilling reserve unit or if you are an officer, a civilian, or a member of the U.S. Army, Air Force, Marine Corps, or Coast Guard, use the ADP answer sheets provided In your course package. You should use one blank original ADP answer sheet for each assignment. Use only the original ADP answer sheet provided in your course package; NETPMSA will not accept reproductions.

Recording Information on the ADP Answer Sheets: Follow the "MARKING INSTRUCTIONS" on each answer sheet. Be sure that blocks 1, 2, and 3 are filled in correctly. This information is necessary for your course to be properly processed and for you to receive credit for your work.

As you work the course, be sure to mark your answers in the course booklet because your answer sheets will not be returned to you. When you have completed an assignment, transfer your answer from the course booklet to the answer sheet.

Mailing the Completed ADP Answer Sheets: Upon completing an assignment, mail the completed answer sheet to:

COMMANDING OFFICER
NETPMSA CODE 074
6490 SAUFLEY FIELD RD
PENSACOLA FL 32559-5000

Use envelopes to mail your answer sheets. You must provide your own envelopes or request them from your ESO. You may enclose more than one answer sheet in a single envelope. Remember, regardless of how many answer sheets you submit at a time, NETPMSA should receive at least one assignment a month.

NOTE: DO NOT USE THE COURSE COMMENTS PAGE AS AN ENVELOPE FOR RETURNING ANSWER SHEETS OR OTHER COURSE MATERIALS.

Grading: NETPMSA will grade the answer sheets and notify you by letter concerning your grade for each assignment, your incorrect answers, and your final grade. The passing score for each assignment is 3.2. If you receive less than 3.2 on any assignment, you must rework the assignment. NETPMSA will enclose a new ADP answer sheet in the letter notifying you of the questions you answered incorrectly. You will be required to redo the assignment and resubmit the new answer sheet. The maxium score you can receive for a resubmitted assignment is 3.2.

Course Completion: When you complete the last assignment, fill out the "Course Completion" form in the back of the course and enclose it with your last answer sheet. NETPMSA will issue you a letter certifying that you satisfactorily completed the course. You should make sure that credit for the course is recorded in your service record. YOU MAY RETAIN THE TEXT.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN NOT MAIL. This is especially important if you are taking the course for Naval Reserve retirement credit. You must mail your answer sheets at least 60 days before your anniversary date. This will provide you with enough time for delays in the mail or reworking failed assignments. DO NOT MAIL YOUR ASSIGNMENTS TO THE NAVAL RESERVE PERSONNEL COMMAND (NRPC).

Student Questions: Refer questions concerning this course to NETPMSA by mail (use the address on page ii) or by telephone: DSN 922-1366 or commercial (904) 452-1366.

NAVAL RESERVE RETIREMENT CREDIT

If you are a member of the Naval Reserve, you till receive retirement points if you are authorized to receive them under current directives governing retirement of Naval Reserve personnel. For the purpose of Naval Reserve retirement, this edition of the course is evaluated at 18 points. Those points will be credited as follows:

12 points for the satisfactory completion of assignments 1 through 8 and

6 points for the satisfactory completion of assignments 9 through 12.

NOTE: YOUR OFFICIAL COURSE COMPLETION DATE WILL BE THE DATE YOUR LAST ASSIGNMENT IS PROCESSED THROUGH THE NETPMSA ADP SYSTEM--NOT THE DATE YOU DEPOSIT THE LAST ASSIGNMENT IN THE MAIL. Refer to the Course Completion paragraph under section B. ADP Answer Sheets.

COURSE OBJECTIVES

In completing this Nonresident Training Course (NRTC), you will demonstrate a knowledge of the subject matter by correctly answering questions on the following: Construction Methods and Materials: Heavy Construction; Construction Methods and Materials: Electrical and Mechanical Systems; Horizontal Construction; Project Drawings; Specifications/Material Estimating/Advanced Base Planning; Care and Adjustment of Surveying Equipment; Indirect Level/Level and Traverse Computations; Topographic Surveying and Mapping; Plane-Table Topography and Map Projection; Engineering and Land Surveys; Horizontal and Vertical Curves; Electronic Surveying Equipment, and Material Testing.

Naval courses may include several types of questions—multiple-choice, true-false, matching, etc. The questions are not grouped by type but by subject matter. They are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Not all courses use all of the types of questions available. The student can readily identify the type of each question, and the action required, by inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

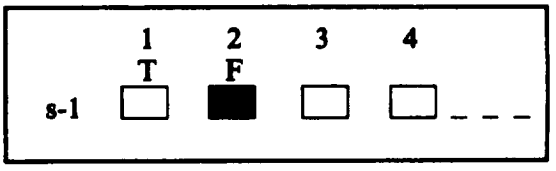
Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. Who was the first person appointed Secretary of Defense under the National security Act of 1947?

1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:



TRUE-FALSE QUESTIONS

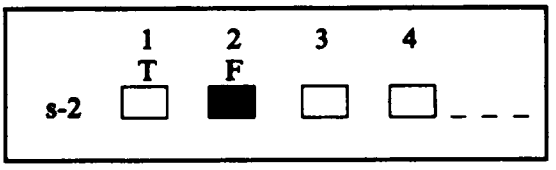
Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the aswer sheet.

SAMPLE

s-2. All naval officers arc authorized to correspond officially with any systems command of the Department of the Navy without their respective commanding officer's endorsement.

1. True
2. False

Indicate in this way on the answer sheet:



MATCHING QUESTIONS

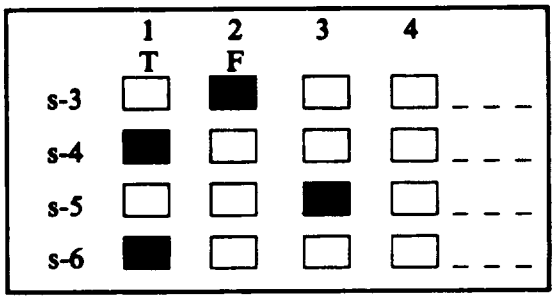
Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B maybe used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions. Some responses maybe used once, more than once, or not at all.

A. OFFICER	B. DEPARTMENT
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Disbursing Officer	3. Supply Department
s-6. Communications Officer	

Indicate in this way on the answer sheet:



ASSIGNMENT 1

Textbook Assignment: "Construction Methods and Materials: Heavy Construction," chapter 1, pages 1-1 through 1-28.

Learning Objective: Identify the different components of a bridge and describe how those components are used.

1-1. In the Naval Construction Force (NCF), to what does the term "heavy construction" refer?

1. A project in which extra-heavy structural members are used
2. A project in which large bulks of materials are used
3. Bridge or waterfront construction
4. Each of the above

1-2. A bridge having only one intermediate support is referred to as a/an

1. single span
2. intermediate span
3. multispan
4. double span

A. Substructure

B. Abutment

C. Sill

D. Footing

E. Corbel

F. Pier

Figure 1A

IN ANSWERING QUESTIONS 1-3 THROUGH 1-7, SELECT FROM FIGURE 1A THE TERM THAT IS BEST DEFINED BY THE QUESTION.

1-3. That part of an overall bridge structure that transmits the combined live and dead loads directly to the earth foundation.

1. A
2. B
3. C
4. D

1-4. The aggregate total of all bridge components located below the stringers.

1. A
2. B
3. E
4. F

1-5. A type of structural framework that includes two or more rows of posts or piles.

1. B
2. C
3. E
4. F

1-6. One of two supports located at the ends of a bridge superstructure.

1. B
2. C
3. D
4. E

1-7. The part of a timber-sill abutment that carries the loads imposed by the stringers.

1. A
2. C
3. D
4. E

1-8. Which of the following components is NOT a part of the flooring system of a bridge?

1. Curb
2. Deck
3. Stringers
4. Handrails

1-9. What structural member(s) of a bridge carry(ies) only the live load of the traffic plus the dead load of the flooring?

1. Abutment sill
2. Pile or post caps
3. Stringers
4. Corbels

Learning Objective: Describe the terminology, methods, and materials used in foundation and pile construction.

1-10. Which, if any, of the following characteristics is common to both foundations and piles?

1. Both are always constructed of reinforced concrete
2. Both distribute the total weight of a building or structure to the natural earth
3. Both are used to resist only a vertically applied load
4. None of the above

1-11. What element of a foundation ultimately carries the total dead and live loads imposed by a building or structure?

1. Foundation bed
2. Foundation wall
3. Footing

1-12. A structural engineer is preparing to design the foundation for a large building that is to be built on a site known to have uneven subsoil conditions. What type of foundation can the engineer design that will minimize the possible effects of this condition?

1. Continuous
2. Spread
3. Grade beam
4. Mat

1-13. The larger end of a tapered precast concrete pile is its

1. butt
2. tip
3. shank
4. closed end

1-14. What type of piles should you specify for use in preventing the walls of a trench from caving in?

1. Bearing
2. Sheet
3. Batter
4. H

1-15. To join the edges of concrete sheet piles, in what form or shape are the edges cast?

1. Deep
2. Arch
3. Interlock
4. Tongue and groove

Learning Objective: Identify types of waterfront structures and their uses.

1-16. In which of the following ways are a breakwater and a jetty both (a) similar and (b) different?

1. (a) Both are used to direct the current flow in a channel (b) a breakwater is an alongshore structure
2. (a) Both are alongshore structures used to break the action of waves (b) a jetty has a paved top for vehicular traffic
3. (a) Both are offshore structures used to break the action of waves (b) a jetty directs the current flow along the line of a channel
4. (a) Both are harbor-shelter structures (b) a breakwater extends out from the shoreline

1-17. To establish a definite shoreline and maintain it against wave erosion, what type of structure should the engineer design?

1. Seawall
2. Breakwater
3. Jetty
4. Groin

1-18. To allow ships to lie alongside for loading and unloading, what type of structure should be used?

1. Wharfage
2. Offshore
3. Stable shoreline
4. Mole

1-19. In which of the following conditions can a concrete cap structure be used on a breakwater or jetty?

1. Deep-water site only
2. Extra-high tide range only
3. Deep-water site or extra-high tide range
4. Shallow-water site

1-20. How are the individual units of a precast cap structure for a breakwater (a) taken to and (b) placed in their proper location?

1. (a) Floated (b) sunk
2. (a) Carried (b) driven
3. (a) Craned (b) dropped
4. (a) Barged (b) unloaded

1-21. In which of the following uays are a seawall and a bulkhead both (a) similar and (b) different?

1. (a) Both protect a shoreline against erosion (b) a bulkhead is supported by its own weight
2. (a) Both protect a shoreline against erosion (b) a bulkhead is relatively thin and usually consists of steel sheet piles
3. (a) Both are relatively thin and self-contained (b) bulkheads are normally cast-in-place concrete structures
4. (a) Both are relatively thick and self-contained (b) a bulkhead can be constructed using wooden sheet piles

1-22. To allow ships to come alongside, bulkheads are fitted with

1. wales and anchors
2. piles and quays
3. timber caps and batter fenders
4. mooring cleats and dolphins

1-23. In what way, if any, does the purpose of a dolphin differ from that of a pile cluster?

1. Dolphins are used to protect a pier, while pile clusters protect offshore structures
2. Dolphins are used to protect moles, while pile clusters protect groins
3. Dolphins are used to protect ships only, while pile clusters protect piers only
4. None. They are both used as protection for both piers and ships

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Learnning Objective: Describe the types of fasteners and connectors used in heavy-timber construction.

1-24. What type of heavy-timber fastener has square heads and nuts?

1. Pin
2. Bolt
3. Spike
4. Rail

1-25. In timber construction, what is the minimum spacing, in inches, between bolts?

1. 9
2. 7
3. 3 1/2
4. 1 1/2

1-26. A timber fastener that is used primarily to prevent one member from moving laterally in relation-ship to another is called a

1. lag bolt
2. driftbolt
3. cleat
4. dowel

1-27. A short length of timber that is spiked or bolted to the adjoining members of a joint is a

1. connector
2. scab
3. cleat
4. block

1-28. What is the general term applied to the variety of devices used in bolted-lap joints between heavy timbers?

1. Driftpins
2. Spike grids
3. Expansion bolts
4. Timber connectors

1-29. What type of connector is embedded in circular grooves in the faces of the timbers being jointed?

1. Spike grid
2. Toothed ring
3. Split ring
4. Shear plate

1-30. Which, if any, of the following rings is/are are embedded by pressure?

1. Toothed ring only
2. Spike grid only
3. Toothed ring and spike grid
4. None of the above

Learning Objective: Identify different structural steel shapes and their uses.

1-31. What standard structural shape is most commonly used for columns?

1. C
2. HP
3. S
4. W

1-32. For what reason does the W-shape provide greater strength than the S-shape?

1. Its flanges have a greater cross-sectional area
2. Its web has a greater cross-sectional area
3. The inner faces of its flanges are tapered towards the web
4. The width of the flanges is always much greater than those of the S-shape

1-33. What does the structural-steel designation “W14 x 74” signify?

1. A W-shape member that is 74 inches long with 14-inch-wide flanges
2. A W-shape member that is 74 feet long with a 14-inch-deep web
3. A W-shape member with a 14-inch-deep web and a weight of 74 pounds per linear foot
4. A W-shape member that weighs 14 pounds per linear foot and is 74 feet long

1-34. In what way does an HP-shape member differ from a correspondingly sized M-shape structural steel member?

1. The width of its flanges are slightly larger
2. It has a greater cross-sectional area overall
3. Its flanges have a greater cross-sectional area only
4. Its web has a greater cross-sectional area only

1-35. The S-shape structural steels have a cross section shaped like what letter?

1. C
2. I
3. S
4. W

1-36. What is the symbol used for an American Standard channel?

1. SC
2. MC
3. C
4. [

1-37. A structural steel shape whose cross section resembles the letter L is a/an

1. bar
2. angle
3. tee
4. plate

1-38. In the designation of a structural steel angle having unequal legs, what dimsnsion should you list first?

1. Wider leg
2. Narrow leg
3. Thickness
4. Length

1-39. A flat structural steel shape having a cross section that measures 6 1/2 inches by 3/4 Inches is called

1. steel plate
2. sheet metal
3. bar

1-40. A 40-pound plate is the same as a

1. 1-inch plate
2. 2-inch plate
3. 1 1/2-inch plate
4. 2 1/2-inch plate

1-41. What structural shape should you specify for bracing and connecting heavy structural msmbers?

1. S-shape
2. C-shape
3. Angle
4. Flat or round bar

Learning Objective: Describe differing steel construction methods used for steel frame structures.

1-42. The processing of raw materials to form finished members of steel structures is called

1. election
2. manufacturing
3. prefabrication
4. fabrication

1-43. The rigging and hoisting of steel members to their proper places in a steel structure is part of what process?

1. Fabrication
2. Erection
3. Construction
4. Prefabrication

1-44. What method of steel construction uses masonry walls to support structural floor- and roof-framing members?

1. Skeleton
2. Long span
3. Wall bearing

1-45. Built-up girders, trusses, and bar joists are all commonly used in what method of steel construction?

1. Skeleton
2. Long span
3. Wall bearing

1-46. Horizontal structural members connecting the exterior columns of a skeleton structure are called

1. lintels
2. girders
3. floor beams
4. spandrel beams

1-47. In skeleton construction, by what means can the size of a structure be enlarged to provide additional floor space?

1. Add additional columns only
2. Add additional beams only
3. Add additional columns, beans, and girders
4. Add additional columns and beams only

1-46. A vehicle passes over a steel-truss bridge. In what order is the imposed loading from the truck transmitted through the bridge members to the supporting abutments?

1. Decking, stringers, transverse beams, trusses, end pedestals, bearing plates
2. Decking, trusses, stringers, transverse beams, bearing plates, end pedestals
3. Trusses, decking, transverse beams, stringers, end pedestals, bearing plates
4. Trusses, transverse beams, decking, stringers, end pedestals, bearing plates

1-49. Which of the following reasons is an advantage of preengineered metal structures?

1. They can be quickly erected
2. The individual members or components are factory-built
3. They are chipped as complete kits
4. Each of the above

Learning Objective: Identify common connectors used in steel frame structures.

1-50. In the military, what connectors are most comnonly used for steel construction?

1. Pins and welds
2. Pins and rivets
3. Bolts and welds
4. Rivets and bolts

1-51. What type of connector is used at the ends of bracing rods or where freedom of rotation is required?

1. Bolt
2. Pin
3. Weld
4. Rivet

1-52. In steel building construction, what type of connector is used more that any other type?

1. Weld
2. Bolt
3. Pin
4. Rivet

1-53. When bolts are used, how does the hole size compare to the nominal bolt size?

1. Half-size larger
2. Same size
3. Slightly smaller
4. Slightly larger

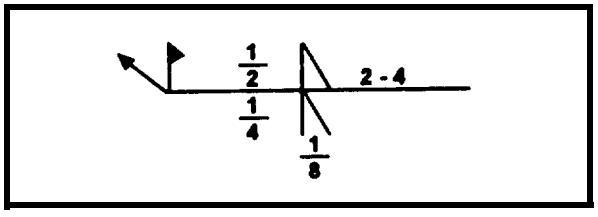

Figure 1B

IN ANSWERING QUESTIONS 1-54 THROUGH 1-56, REFER TO FIGURE 1B.

1-54. What type and size of weld is to be made on the “other side”?

1. 1/4-inch bevel weld
2. 1/4-inch vee weld
3. 1/2-inch fillet weld
4. 1/2-inch bevel weld

1-55. What does the numeral 4 mean?

1. The length of the weld in inches
2. The length of the weld in millimeter
3. The center-to-center spacing of the weld in inches
4. The center-to-center spacing of the weld in millimeters

1-56. What does the small flag shown in the symbol indicate?

1. The “other side” weld only is to be made in the shop
2. The “arrow side” weld only is to be made in the field
3. Both the “other side” and “arrow side” welds are to be made in the shop
4. Both the “other side” and “arrow side” welds are to be made in the field

1-57. When a reference is not required, what part of a welding symbol can be omitted?

1. The arrow
2. The reference line
3. The tail
4. The detail reference symbol

1-58. For structural work, the diameter of rivets most often used are

1. 1 and 1 1/4 inches
2. 3/4 and 7/8 inch
3. 1/2 and 5/8 inch
4. 1/4 and 3/8 inch

1-59. For a 1-inch-diameter rivet, what size hole should be drilled?

1. 1 inch
2. 1 1/16 inches
3. 1 3/16 inches
4. 1 1/4 inches

1-60. For structural steework, rivets are manufactured from what type of material?

1. Iron
2. Hard steel
3. Soft steel
4. Aluminum

ASSIGNMENT 2

Textbook Assignment: "Construction Methods and Materials: Electrical and Mechanical Systems," chapter 2, pages 2-1 through 2-22.

Learning Objective: Describe electrical power systems and equipment.

2-1. Which of the following items are NOT part of a power transmission system?

1. Power generating plants
2. Circuits carrying large bulks of high-voltage power
3. Subtransmission substations
4. Primary feeders

2-2. In which of the following manners are transmission circuits most often run?

1. Overhead on poles or towers
2. Direct-buried
3. Underground in cable duct
4. All of the above

2-3. For which of the following purposes are substations used in an electrical power system?

1. To step-up voltage only
2. To step-up or step-down voltage
3. To provide protection against faults
4. Both 2 and 3 above

2-4. At what location in a power system does the distribution system begin?

1. At the generating plant
2. At the distribution substation
3. At the distribution center
4. At the distribution transformer

2-5. Which of the following items are NOT part of a typical power distribution system?

1. Circuit breakers
2. Service entrances
3. Service drops or laterals
4. All of the above

A. Radial system

B. Loop system

C. Network system

Figure 2A

IN ANSWERING QUESTIONS 2-6 THROUGH 2-9, SELECT FROM FIGURE 2A THE TYPE OF FEEDER SYSTEM THAT BEST MATCHES THE CHARACTERISTIC GIVEN AS THE QUESTION.

2-6. Starts and ends at the same distribution substation.

1. A
2. B
3. C

2-7. Least costly but most unreliable type of feeder system.

1. A
2. B
3. C

2-8. Uses subfeeders and branch circuits to take power to load centers.

1. A
2. B
3. C

2-9. Readily adaptable to future requirements.

1. A
2. B
3. C

2-10. Conductors used for connecting distribution transformers to the feeder circuit are called

1. distribution mains
2. secondary mains
3. primary mains
4. service drops

2-11. The primary purpose of a distribution transformer is to

1. increase voltage to primary distribution levels
2. protect the primary feeders against overloads
3. protect secondary feeders against overloads
4. decrease voltage to utilization levels

2-12. What overhead circuits carry power from the transformer to the customer through one or more service drops?

1. Single-phase primaries only
2. Single- or three-phase primaries
3. Single-phase secondaries only
4. Single- or three-phase secondaries

2-13. To neutralize an underground branch circuit in the distribution system, which of the following control or protective devices should the electrician open?

1. An air switch
2. An oil switch
3. A recloser
4. A distribution cutout

2-14. Lightning arresters are required at which of the following locations?

1. At all substations
2. On the primary side of all transformers
3. At all distribution centers and capacitor banks
4. All of the above

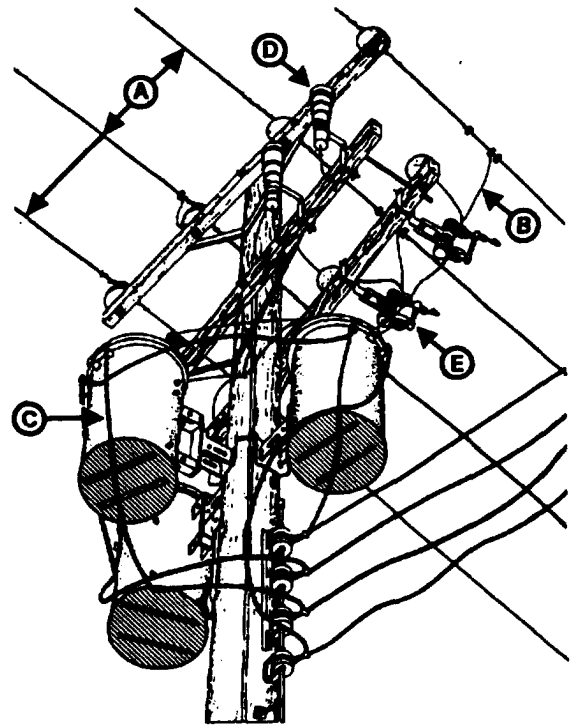

Figure 2B

IN ANSWERING QUESTIONS 2-15 THROUGH 2-20, REFER TO FIGURE 26.

2-15. What type of distribution line is identified by the letter “A”?

1. Primary feeder
2. Primary main
3. Secondary main
4. Service drop

2-16. What type of distribution line is identified by the letter “B”?

1. Primary feeder
2. Primary main
3. Secondary main
4. Service drop

2-17. What type of distribution line is identified by the letter “C”?

1. Primary feeder
2. Primary main
3. Secondary main
4. Service drop

2-18. What is the device identified by the letter “D”?

1. Insulator
2. Lightning arrester
3. Fused cutout
4. Circuit breaker

2-19. What is the device identified by the letter “E”?

1. Recloser
2. Circuit breaker
3. Air switch
4. Fused cutout

2-20. The transformers shown are what type?

1. Completely self-protected
2. Self-protected
3. Conventional

Learning Objective: Describe conductor supports, methods of guying poles, and factors considered in pole layout.

2-21. In an electrical power system, the supporting structures for the conductors must be designed to

1. support the ueight of the conductors
2. support the ueight of all transformers or other equipment mounted on the support
3. provide required clearances from the ground to the conductors and between the conductors
4. do all of the above

2-22. Which of the following circumstance provide the best justification for placing an electrical distribution system underground, rather than overhead?

1. When the system is to be installed in an area subject to major termite damage
2. When underground installation is justified on the basis of initial construction cost only
3. When an economic analysis shows that construction and long-term maintenance costs are less for underground installation
4. When the system to be installed would impede airfield traffic

2-23. The availability of wood poles at any given naval installation depends upon which of the following factors?

1. Strength
2. Species
3. Size
4. Class

2-24. When designing an overhead distribution system, for which of the following reasons might an engineer select a Class 2 pole, rather than a Class 5 pole?

1. When a longer pole is needed to obtain necessary clearances
2. When a stronger pole is needed to support the loads that will be applied to the pole
3. When a pole having a smaller butt circumference is required due to local conditions on the ground
4. When the design loads are less than those requiring a Class 2 pole

2-25. Which of the following criteria is/are NOT considered when an engineer determines the required length of a wooden power distribution pole?

1. Usage of the pole
2. Future growth index of the area
3. Both 1 and 2 above
4. Safety and working clearances

2-26. In the Navy, which of the following types of poles may be used for street-lighting circuits?

1. Aluminum or steel only
2. Aluminum, wood. or concrete only
3. Aluminum, steel, wood, or concrete
4. Aluminum or concrete only

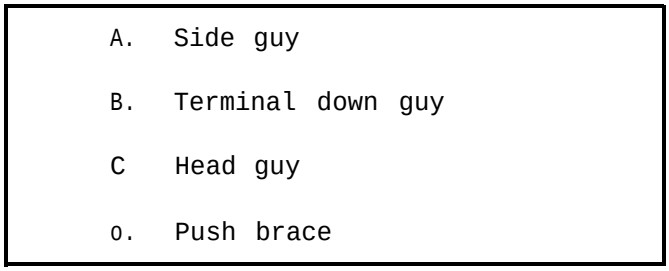

Figure 2C

IN ANSWERING QUESTIONS 2-27 THROUGH 2-29, SELECT FROM FIGURE 2C THE TYPE OF POLE GUY OR SUPPORT THAT CAN BE USED TO BEST SATISFY THE CONDITION GIVEN AS THE QUESTION.

2-27. Used to transfer loads from one pole to another.

1. A
2. B
3. C
4. D

2-28. Used at the end of a pole line.

1. A
2. B
3. C
4. D

2-29. Counterbalances the pull of conductors in a curved portion of the line when guy anchors are impracticable.

1. A
2. B
3. C
4. D

2-30. Which of the following factors are important for an engineer to consider when selecting the route for a new overhead distribution line?

1. Future maintenance economy
2. Trends in population growth
3. Distance and terrain conditions
4. All of the above

Learning Objective: Describe electrical distribution drawings, their uses, and their requirements.

2-31. You are preparing a preliminary site plan for a new public works maintenance facility. On this site plan, the electrical design engineer requires information, such as the location, identification, and class of existing distribution poles; the location, identification, and capacity of existing transformers; and the size, type, and voltage of existing overhead and underground conductors. In what source(s) should you look first to find this information?

1. The station’s electrical distribution drawings or plans
2. The surveyor’s field books
3. The station master plan
4. The electrical site plans for all surrounding buildings or facilities

2-32. Electrical manholes are identified on electrical utility drawings by

1. number and type only
2. symbol, dimensions, and elevation
3. identification number, location, type, dimensions, and top and invert elevations
4. number, type, and complete electrical data

2-33. In distribution drawings, what element of a pole schedule keys the schedule to the plan?

1. Identification number
2. Pole classification
3. Drawing symbol
4. Pole location

2-34. When using the as-built construction drawings of a large Navy building, in what division of the drawings should you look to find the size, type, and voltage of the service laterals leading to the building?

1. Civil
2. Architectural
3. Mechanical
4. Electrical

2-35. For the construction of a reinforced concrete transformer vault, which of the following information would more likely be found in the construction specifications, rather than the construction drawings?

1. Dimensions of the vault
2. Capacity of the transformers to be housed in the vault
3. Slump and strength requirements for the concrete
4. Size and spacing of the reinforcing steel

Learning Objective: Identify different types of water sources and describe the factors considered when selecting a water source for development.

2-36. In general, the earth's most common source for supplying water is classified as

1. surface water
2. subsurface water
3. groundwater
4. rainwater

2-37. The term "water table" refers to the

1. upper level of groundwater collected over an impervious stratum
2. lower level of groundwater collected over an impervious layer of earth
3. distance from the ground surface to the upper level of groundwater collected over an impervious stratum
4. distance from the ground surface to the lower level of groundwater collected over an impervious layer of earth

2-38. Which of the following factors has the greatest influence on the water table in any given geographic region?

1. Rainfall
2. Surface runoff
3. Soil permeability
4. Subsurface geology

2-39. On Navy or Marine Corps installations, what is the most common source of potable water?

1. Artesian wells and springs
2. Public reservoirs
3. Catchment basins
4. Natural lakes and streams

2-40. A water source that supplies sufficient water for unlimited time is said to be

1. plentiful
2. potable
3. reliable
4. palatable

2-41. The two most important factors that influence water quantity within a given area are

1. geology and rainfall
2. availability and demand
3. population growth and climate
4. topography and geology

2-42. Before the quality of a water source can be deemed suitable for human needs, what action must first be taken?

1. Filtering
2. Treating
3. Disinfecting
4. Testing

2-43. What special development process or action must be performed to make brackish water acceptable as a water supply for human needs?

1. Desalination
2. Chlorination
3. Sedimentation

2-44. Which of the following descriptions best define a water supply system?

1. All of the piping used to transport water
2. All of the piping, reservoirs, and system accessories used to transport and store water
3. All of the facilities, equipment, and piping used to obtain, treat, and transport water
4. A combination of connected pipes that carry supplied water to its users

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Learning Objective: Describe the elements and layout of a water distribution system.

2-45. Large size water lines that interconnect with smaller distribution mains are called

1. trunk mains
2. arterial mains
3. branch mains
4. feeder mains

2-46. What system accessories are used for fire-fighting purposes?

1. Valves
2. Hydrants
3. Booster stations
4. Backflow preventers

2-47. Which of the following components should be used to protect against nonpotable water contaminating the water system?

1. Booster valve
2. Main-line meter
3. Backflow preventer
4. Service conection

2-48. What type of branch is best for water distribution?

1. Loop
2. Tree
3. Cross
4. Lateral

2-49. On branch mains, a shutoff valve should be installed at what distance from the feeder?

1. 25 feet
2. 50 feet
3. 75 feet
4. As close as possible

2-50. Under preferable conditions, a hydrant should be located no closer than how many feet from a building?

1. 25
2. 50
3. 75
4. 100

IN ANSWERING QUESTION 2-51, REFER TO FIGURE 2-19 IN YOUR TEXTBOOK.

2-51. For this to be a detailed water distribution drawing that meets MINIMUM requirements, which of the following additional information should be shown for the 10-inch line that roughly parallels the B & O Railroad tracks?

1. Type of pipe only
2. Type of pipe and the location, size, and type of shutoff valve(s), if any, that are needed to isolate the line
3. Type of pipe and its depth below grade
4. Type of pipe and its gradient

Learning Objective: Describe the elements and structures of a typical wastewater collection system

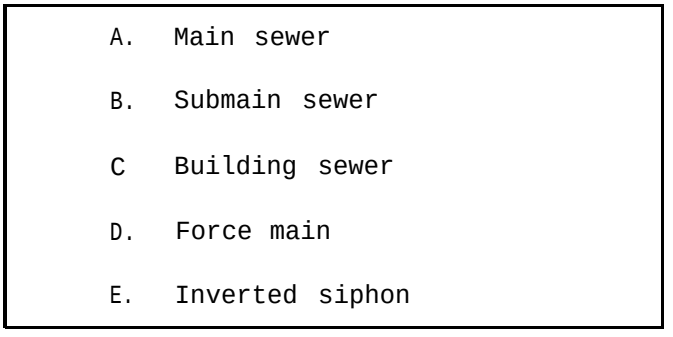

Figure 2D

IN ANSWERING QUESTIONS 2-52 THROUGH 2-55, SELECT FROM FIGURE 2D THE SYSTEM ELEMENT OR STRUCTURE THAT BEST SATISFIES THE CONDITION GIVEN AS THE QUESTION.

2-52. May be less than 8 inches in diameter.

1. A
2. B
3. C
4. D

2-53. May receive affluent from a branch sewer plus a lateral.

1. A
2. B
3. C
4. E

2-54. Designed to flow full and under pressure.

1. A only
2. A and D
3. D only
4. D and E

2-55. Also called a trunk sewer.

1. A
2. B
3. C
4. D

2-56. For gravity piping in general, the gradient should be such that the wastewater moves at what minimum rate of speed?

1. 1 foot per second
2. 2 feet per second
3. 3 feet per second
4. 4 feet per second

2-57. What system elements or structures should be placed at all locations where wastewater piping changes direction, grade, or size?

1. Force mains
2. Inverted siphons
3. Manhole
4. Intercepting sewers

2-58. When, if ever, is it permissible to run a sanitary sewer line and a water line in the same trench?

1. When the water line is installed 3 feet below the sewer line
2. When the sewer line is installed 3 feet below the water line
3. When the water pipe is encased in a concrete sleeve
4. Never

2-59. When an engineer determines the design flow of a sewer line, what two factors are sometimes combined by addition?

1. Daily flow and peak flow
2. Average usage and daily flow
3. Peak flow and infiltration allowance
4. Daily flow and infiltration allowance

2-60. In wastewater system design, the average daily flow is based on an average per capita usage of how many gallons of water per day?

1. 75
2. 100
3. 150
4. 200

ASSIGNMENT 3

Textbook Assignment: "Horizontal Construction." Pages 3-1 through 3-19.

Learning Objective: Identify and describe road nomenclature and associated terminology used in construction drawings.

3-1. Which of the following is NOT an example of a military road?

1. Two-lane highway
2. Airfield runway
3. Parking apron
4. Quarry hauling road

A.	Cut
B.	Final grade
C.	Existing grade
D.	Fill
E.	Subgrade
F.	Surface

Figure 3A

IN ANSWERING QUESTIONS 3-2 THROUGH 3-5, SELECT FROM FIGURE 3A THE TERM THAT IS BEST DEFINED BY THE QUESTION.

3-2. The completed road surface elevation.

1. B
2. C
3. E
4. F

3-3. The undisturbed earth on an initial survey.

1. B
2. C
3. E
4. F

3-4. The distance required to get down to the final grade.

1. A
2. B
3. D
4. F

3-5. The portion of the road that is at final grade.

1. C
2. D
3. E
4. F

3-6. What term best describes the difference in elevation between the edge of the finished road and the center line?

1. Slope ratio
2. Superelevation
3. Crown
4. Roadway

3-7. What term defines the limits of the earthwork for a road?

1. Roadbed
2. Shoulder
3. Traveled way
4. Roadway

3-8. You are the notetaker on a road survey crew. All man-made objects should be noted in the book in what manner?

1. By station number only
2. By distance from the center line only
3. By station number and distance from the center line
4. By the approximate location and distance

3-9. The drawing that contains construction limits, station markings, and all curve information is known by what name?

1. Profile plan
2. Road plan
3. Plan-and-profile sheet
4. Site plan

3-10. What is the minimum information needed by a survey crew to perform the preliminary route survey?

1. Selected route
2. Aerial photographs
3. Area topography
4. Plan-and-profile sheet

3-11. Which of the following terms is another name for “I” when discussing curve data?

1. Degree of curvature
2. Deflection angle
3. Radius
4. Interior angle

3-12. Which of the following angles describe the relationship between the radius and (a) the point of curvature and (b) the point of tangency?

1. (a) 45° angle (b) 90° angle
2. (a) 90° angle (b) 45° angle
3. (a) 45° angle (b) 45° angle
4. (a) 90° angle (b) 90° angle

3-13. The length of a curve is measured from what points?

1. From the PI to the PC and the PT
2. Along the curve from the PC to the PT
3. Along the radius to the PT
4. Along the radius to the PC

3-14. What is the radius of a 30° curve?

1. 198.90 ft
2. 189.90 ft
3. 190.98 ft
4. 198.98 ft

3-15. If I = 62° and D = 30°, what is the length of the curve?

1. 206.67 ft
2. 206.76 ft
3. 207.67 ft
4. 207.76 ft

3-16. “Superelevation” is defined as the difference in elevation between the

1. center line and the outside edge
2. center line and the inside edge
3. inside edge and the outside edge
4. PC and the PT

3-17. A control point cannot be a PT or POT.

1. True
2. False

3-18. Vertical curves may have which of the following values?

1. Positive only
2. Negative only
3. Positive or negative

3-19. A road profile is a vertical section along the center line.

1. True
2. False

3-20. A grade line may represent final elevation or subgrade elevation.

1. True
2. False

3-21. A vertical curve differs from a horizontal curve in which, if any, of the following ways?

1. The way the length is measured
2. The stations start at 0 + 00
3. Laid out using a constant radius
4. None of the above

3-22. A vertical curve at the crest of a hill is what type of curve?

1. Sag
2. Undervertical
3. Overhead
4. Summit

3-23. When the center-line grade rises 3 feet in 75 feet horizontal distance, what is the slope of the grade line?

1. +3.0%
2. -3.0%
3. +4.0%
4. -4.0%

3-24. In a road plan, what term is used to designate grade points?

1. Station
2. Profile
3. Elevation
4. Grade

3-25. On a road plan. station numbers are (a) lettered and (b) located in what manner?

1. (a) Horizontally above the profile
   (b) right of the appropriate vertical grid line
2. (a) Horizontally below the profile
   (b) left of the appropriate vertical grid line
3. (a) Horizontally above the profile
   (b) centered on the appropriate vertical grid line
4. (a) Horizontally below the profile
   (b) centered on the appropriate vertical grid line

3-26. In a profile and grade-line drawing, all drainage structures are dimensioned by

1. station
2. type
3. detail
4. notes

3-27. The minimum clearing width on the left side of the roadway is how much greater than construction limits?

1. 5 ft
2. 6 ft
3. 10 ft
4. 12 ft

3-28. Which of the following materials may be used as a base course in road construction?

1. Sand
2. Gravel
3. Concrete
4. Each of the above

3-29. The surface course is placed over the

1. base
2. subgrade
3. subbase
4. roadbed

3-30. A typical section of a road shows exactly what about the road?

1. How it looks before construction begins
2. How it will look upon completion
3. How it should look after construction
4. How it looks at station 0 + 00 and the final station only

3-31. A typical straight road section differs from a typical curve section in what way?

1. Shape of the road only
2. Width of the road only
3. Shape and width of the road

3-32. You have completed a route survey and are to draw cross sections from the notes. What type of section will be drawn first?

1. Preliminary
2. Final
3. Typical
4. As-built

3-33. Preliminary cross sections are used in conjunction with (a) what sections and (b) for which of the following purposes?

1. (a) Final (b) to determine as-built conditions
2. (a) As-built (b) to determine construction errors
3. (a) Typical (b) to determine existing material usefulness
4. (a) finished roadbed (b) to determine earthwork requirements

3-34. Final cross sections show which of the following information?

1. Finished elevation
2. Actual cross-sectional shape of the curves
3. Distances of ditches from the center line
4. Each of the above

3-35. When, if ever, should a route be relocated due to drainage problems?

1. When planned through a forest
2. When located in a floodplain
3. When underground springs are a mile away
4. Never

3-36. Which, if any, of the following actions should be taken during road construction to prevent standing puddles on the roadway?

1. Slant the worked surface of the road to provide quicker runoff
2. Cut ditches outside the construction limits
3. Raise the final grade of the roadway
4. None of the above

3-37. A perforated pipe is placed in the bottom of a trench and backfilled to a designated depth to lower the water table. What term describes this action?

1. French drain
2. Trenching
3. Bleeders
4. Tile drain

3-38. You lay out a 50-foot ditch for subsurface drainage. What is the minimum grade, in feet, allowed?

1. 0.10
2. 0.15
3. 0.25
4. 0.30

3-39. Which, if any, of the following effects does rainfall have on a roadway?

1. Cleans the road surface
2. Erodes the roadway
3. Weakens road if allowed to stand
4. None of the above

3-40. Your center-line elevation is 0.25 feet higher than the edge of the road. What term best describes this condition?

1. Superelevation
2. Drainage
3. Ditching
4. Crown

3-41. Which of the following factors should you consider when determining the size and type of roadway ditches?

1. Soil types
2. Lay of the land
3. Volume of water
4. Each of the above

3-42. Which of the following conditions occur when using a minimum grade on ditches?

1. Excessive erosion
2. Increased water-runoff velocity
3. Ponding effect

3-43. The purpose of check dams is to

1. collect water
2. slow waters
3. form ponds
4. beautify the roaduay

3-44. What type of ditch should be used to move a large volume of water?

1. V-bottom
2. Diversion
3. Trapezoidal
4. Flat bottom

3-45. Which of the following materials has the greatest amount of runoff?

1. Stones
2. Solid rock
3. Sand
4. Silt

3-46. In road construction, whenever a road crosses a stream with a 9-foot cross drain, the drain structure used is called

1. a culvert
2. a bridge
3. a diversion ditch
4. a channel

3-47. Diversion ditches drain excess water away from the roadway to what system?

1. Interceptor ditches
2. Natural earth drains
3. Culverts
4. Storm drains

Learning Objective: Identify and describe airfield nomenclature as used in the construction of standard technical drawings.

3-48. What is another name for a runway?

1. Landing strip
2. Landing area
3. Taxiway
4. Transition surface

3-49. What surface provides access to and from the runway for aircraft?

1. Apron
2. Hardstand
3. Taxiway
4. End zone

3-50. The dimensions for the end zone are specified by what authority?

1. Federal Aviation Authority
2. Air wing commander
3. Aircraft industry
4. ABFC design criteria

3-51. On airfields, flexible pavements can be used in which of the following locations?

1. Refueling sites
2. Shoulders
3. Service aprons
4. Runways

Learning Objective: Identify and describe pavements and the basic standard materials used in the construction of roads and airfields.

3-52. The terms “flexible pavement” and “pavement” may be interchanged.

1. True
2. False

3-53. What asphaltic coat is used to help bind the base course to the surface course?

1. Tack coat
2. Seal coat
3. Rain coat
4. Prime coat

3-54. Which of the following materials can be used as a subbase for roads and airfields?

1. Portland cement
2. Ashes
3. Tar
4. Each of the above

3-55. Uncrushed, washed gravel should NOT be used as base course material due to which of the following factors?

1. Too high a moisture content
2. Lack of fine material
3. Too much binder material
4. Lack of clay content

3-56. When, if ever, should a base course of sandy and gravelly material be used?

1. For light loads with low-bearing values
2. For limited use
3. For heavy loads with high-bearing values
4. Never

3-57. A coarse, crushed aggregate is placed in a relatively thin layer and rolled into place. This is the first step in preparing what type of base?

1. Stabilized
2. Coarse graded
3. Waterbound
4. Macadam

3-58. When sand, gravel, and crushed rock are not available, a base course can be developed from which of the following materials?

1. Cinders
2. Iron ore
3. Shells
4. Each of the above

3-59. What is the most important consideration when using caliche?

1. Moisture content
2. Gradation
3. Compactive effort
4. Drainage

3-60. What type of equipment is recommended for the compaction of tuff?

1. Grader
2. Scraper
3. Sheepsfoot roller
4. Smooth drum roller

3-61. What is the maximum lift for a bituminous base course, in inches?

1. 1.5
2. 2.5
3. 3.5
4. 4.5

3-62. What thickness of bituminous base course, in inches, is equal to 6 inches of concrete base course?

1. 6
2. 8
3. 3
4. 4

ASSIGNMENT 4

Textbook Assignment: "Project drawings."Pages 4-1 through 4-13.
"Specifications/Material Estimating/Advanced Base Planning."
Pages 5-1 through 5- 13.

Learning Objective: Describe the different divisions of project drawings and the types of drawings and information that is contained in each division.

4-1. Which of the following information should you provide in the civil division of project drawings?

1. Direction and distance for all property boundaries
2. Demolition requirement
3. Existing site conditions
4. All of the above

4-2. Which of the following drawings is/are NOT part of the structural division?

1. Foundation plan
2. Building cross section
3. Rebar bending schedules
4. Both 2 and 3 above

4-3. The size of water piping is ALWAYS specified in what dividion(s) of a project drawing?

1 Civil
2. Mechanical
3. Fire protection
4. Each of the above, depending upon the usage of the piping

4-4. When needed, where in a set of project drawings should you show seismic design data?

1. On the first sheet of the project drawings
2. On the first sheet of the civil drawings
3. On the first sheet of the structural drawings
4. On the first sheet of the electrical drawings

4-5. For which of the following reasons is the use of isometric riser diagrams preferred over orthographic riser diagrams?

1. They use standard symbo1s to represent pipe fittings and connections
2. They can be drawn with less regard to proper projection methods
3. They show in elevation each section of a piping system
4. They are three-dimensional representations of an entire piping system

Learning Objective: Describe HVAC systems and equipment.

4-6. What component(s) of a warm-air heating system is/are used to distribute the heated air?

1. Ducts
2. Fans
3. Pumps
4. Heat exchanger

4-7. What component(s) of a warm-air heating system is/are used to circulate the heated air?

1. Ducts
2. Fans
3. Pumps
4. Heat exchanger

4-8. A gravity warm-air heating system must be installed in a basement for which of the following reasons?

1. To allow warm air to be blown upward by fans
2. To hide unsightly ductwork
3. To allow heated air to rise through the ductwork into the areas reguiring heat
4. To provide the necessary floor space for the large-size furnace

4-9. What type of heating system is most often used for heating large industrial shops?

1. Forced-air furnace
2. Unit heaters
3. Steam
4. Hot water

4-10. What type of heating system is designed to compensate for the loss of body heat to surrounding surfaces?

1. Forced-air furnace
2. Steam
3. Hot water
4. Radiant

4-11. Which of the following conditions apply to the term *comfort conditioning?*

1. Controlled room temperature
2. Controlled humidity
3. Controlled air quality and motion
4. All of the above

4-12. In addition to cooling, a secondary effect that you achieve with mechanical refrigeration is higher humidity.

1. True
2. False

4-13. What part of a window air-conditioning unit changes the liquid refrigerant to a low-pressure gas?

1. Condenser
2. Condenser coils
3. Evaporator
4. Evaporator coils

4-14. Which of the following descriptions best describes a heat pump?

1. A self-contained air-conditioning unit that you can use for both cooling and heating
2. A device that is built into a window air conditioner that pumps the high-temperature refrigerant gas to the condenser
3. A built-in pump that blows heated air into a room from a self-contained air-conditioning unit
4. A control device that regulates the flow of liquid refrigerant to the evaporator coils

4-15. What publication provides information on the standard mechanical symbols used for preparing HVAC drawings?

1. MIL-HDBK-1006/1
2. MIL-STD-17B
3. MIL-STD-14A
4. MIL-STD-100E

Learning Objective: Describe the various attributes that you should look for when checking and editing project drawings.

4-16. When editing a drawing, you are performing what action?

1. Inspecting the drawing to ensure that all information shown is in compliance with the various data sources
2. Making editorial changes to the drawing
3. Making sure that all appropriate conventions and practices are followed
4. Ensuring that the red-line drawings reflect all changes that occurred during construction

4-17. You begn to edit a construction drawing at what point in the development process?

1. When the drawing is approximately 30-percent complete
2. When the drawing is completed and ready for review
3. As soon as the drawing first begins
4. As soon as the red-line data is ready to be recorded

4-18. When you look at the reverse side of a drawing as it is held against a bright light, what are you checking?

1. The translucency of the tracing paper or vellum
2. The reproducibility of the drawing
3. The opaqueness of the tracing paper or vellum

4-19. When, if ever, should you allow the preparation of a roll–size project drawing?

1. When the required scale of the drawing is too large for flat-size paper
2. When the drawing is deemed to satisfy any of the exceptions noted in MIL-HDBK-1006/1
3. When the size reguirement listed in MIL–STD-100E overrides MIL-HDBK-1006/1
4. Never

4-20. Which of the following groups of drawings is arranged in the proper order?

1. Architectural, civil, structural, electrical, mechanical, plumbing, and fire protection
2. Index, civil, architectural, structural, electrical, mechanical, and plumbing
3. Civil, landscaping, architectural, structural, mechanical, plumbing, and electrical
4. Title sheet, civil, landscaping, architectural, structural, mechanical, fire protection, and plumbing

4-21. When checking a site plan, you should expect to find at least how many dimensions used to locate a building or structure?

1. One
2. Two
3. Three
4. Four

4-22. You are checking a drawing that includes a cross-sectional detail of a chair rail. What is the minimum scale that the detail should be drawn?

1. 3/4 inch equals 1 foot
2. 3/4 inch equals 1 inch
3. 1 1/2 inches equals 1 foot
4. Half scale

4-23. For a flat, D-size project drawing, what title-block format should you use?

1. Horizontal only
2. Vertical only
3. Horizontal or vertical, depending upon your preference or the direction given by your supervisor

4-24. When reviewing a set of A-E prepared project drawings, You find the incorrect phase “By the plumber.” What correct phrase, if any, should have been used?

1. “By the Government”
2. “By others”
3. “By the UT”
4. None

4-25. What publication provides basic guidance and NAVFAC policy for the preparation of project drawings and specifications?

1. MIL-HDBK-1006/1
2. DOD-STD-100E
3. MIL-STD-100E
4. NAVFAC DM-6

Learning Objective: Identify and describe project specifications and the different types of reference specifications.

4-26. Building structure information that CANNOT be shown graphically should be documented in the form of specifications.

1. True
2. False

4-27. What are the basic types of reference specifications that you should use to prepare project specifications for a project located on a Marine Corps installation?

1. Federal specifications
2. EFD regional guide specification
3. NAVFACENGCOM guide specifications
4. Standard specifications

A.	Federal specification
B.	Military specification
C.	Manufacturer’s specification
D.	NAVFACENGCOM standard specification
E.	EFD regional guide specification

Figure 4A

IN ANSWERING QUESTIONS 4-28 THROUGH 4-31, SELECT FROM FIGURE 4A THE TYPE OF SPECIFICATION THAT BEST SATISFIES THE CONDITION GIVEN AS THE QUESTION.

4-28. Covers only the characteristics of materials.

1. A and B
2. B and C
3. A and C
4. C only

4-29. Should NEVER be copied verbatim in project specifications.

1. A
2. C
3. D
4. E

4-30. Must be referenced and must denote any exceptions taken to NAVFACENGCOM directions or requirements.

1. A
2. B
3. D
4. E

4-31. May be used in a given geographical area provided it is just as current as the NAVFACENGCOM guide spec having the same identification number.

1. A
2. B
3. D
4. E

4-32. Which of the following factors should NOT be included in project specifications?

1. Quality of materials
2. Workmanship standards
3. Crew sizes
4. Description of materials

4-33. The project supervisor should take which of the following actions when conflicts occur between the project drawings and the specification?

1. Comply with the drawings
2. Comply with the specifications
3. Obtain guidance from S-3
4. Obtain guidance from the ROICC

4-34. A contractor desiring to bid on a government construction project should find specific bidding requirements in what division of the project specifications?

1. 1
2. 10
3. 3
4. 13

4-35. The quality of all lumber to be used in a project is specified under what division of project specifications?

1. 10
2. 8
3. 6
4. 4

4-36. What division of the project specifications will normally specify the gauge of metal to be used for HVAC ductwork?

1. 5
2. 7
3. 13
4. 15

4-37. The type of materials used in a plumbing system should be specified in what part of the division dealing with plumbing?

1. 1
2. 2
3. 3

4-38. The specified fastening method for ceiling installation of gypsum wallboard should be identified in what part of the Finishes division of the project specifications?

1. 1
2. 2
3. 3

4-39. To save time and effort, you should make reference to NAVFAC and EFD guide specifications in the project specs. This is a common and accepted practice of spec writers.

1. True
2. False

Learning Objective: Define terminology and describe technigues used in material estimating.

4-40. Which of the following qualities is required to be a good estimator?

1. Sound construction knowledge
2. Knowledge of material estimating procedures
3. Knowledge of material estimating pitfalls
4. Each of the above

4-41. When a conflict exists between the general drawing and a detail, which drawing, if either, should you follow?

1. General always
2. Detail unless it is obviously wrong
3. Detail always
4. Neither, contact the drafter

4-42. What step should the estimator do first when starting an estimate?

1. Review the drawings
2. Read NAVFAC P-405
3. Study the specifications
4. Make a rough estimate from the drawings

4-43. The NAVFAC P-405 is based on

1. general construction knowledge
2. timed sample projects
3. Seabees' experience
4. the dart board theory

4-44. Quantity estimates serve a variety of purposes. Which of the following items is NOT based on the quantity estimate?

1. Start dates
2. Manpower needs
3. Delivery schedules
4. Equipment needs

4-45. What method is recommended to check your quantity estimate?

1. Do two separate estimates yourself
2. Have someone review your estimate
3. Have someone else do an estimate and then compare it with your results
4. Have two people do an estimate at the same time and compare their results

4-46. When preparing a material estimate, you do NOT need to read drawing notes to have an accurate estimate.

1. True
2. False

4-47. All drawings are NOT drawn to scale. You cannot scale them to obtain information for an estimate.

1. True
2. False

4-48. Omissions in material estimations are the result of careless examination. Which of the following examples results in omissions?

1. Failure to check for revisions
2. Failure to ensure all the pages are available
3. Failure to review the specifications
4. All of the above

4-49. Your material estimate calls for 100 board feet of 2 x 4s. Should you order the exact amount?

1. No, you must allow for a waste factor
2. Yes, this is the amount needed
3. No, you must allow for excess material build up for future projects

4-50. The term *bulk material* refers to which of the following materials?

1. Concrete
2. Prime coat material
3. Crushed rock
4. Each of the above

4-51. You are calculating an estimate for fill. What reference provides you the compaction factor for a particular type of fill?

1. NAVFAC P-315
2. NAVFAC P-405
3. NAVFAC P–437
4. NAVEDTRA 12540

Learning Objective: Describe the contents and use of NAVFAC P-437 for the planning and installation of ABFC components, facilities, and assemblies.

4-52. Which of the following NAVFAC publications contains estimating information on common facilities and assemblies?

1. NAVFAC P-315
2. NAVFAC P-437, Volume I
3. NAVFAC P-437, Volume II
4. NAVFAC P-405

4-53. What is an NMCB according to the P-437?

1. P-25, component
2. P-25, assembly
3. P-26, facility
4. P-26, component

4-54. Volume II of NAVFAC P-437 lists by national stock number (NSN) the material requirements for which of the following units?

1. Facility
2. Assembly
3. Component
4. Each of the above

4-55. Which of the following statements is not true of the ABFC system?

1. Seabees construct assemblies
2. Facilities comprise components
3. Assemblies comprise facilities
4. Components comprise assemblies

4-56. Volume I of the P-437 contains which of the following information?

1. Sizes of the crews required to operate components
2. Number of acres required for an assembly
3. Drawings of facilities and assemblies
4. Amount of fuel needed to operate components

ASSIGNMENT 5

Textbook Assignment: “Care and Adjustment of Surveying Equipment.” Pages 6-1 through 6-10.

Learning Objective: Identify ways to care for surveying instruments properly.

5–1. In chapter 6, adjustment is best described by which of the following definitions?

1. Aligning the fixed parts of the instrument
2. Aligning the telescope for leveling work
3. Aligning the instrument for a level run
4. Aligning a transit scope for use with a level

5–2. Which, if any, of the following items come with an instrument to assist you with care and maintenance?

1. A tool kit to repair the instrument
2. A prepaid shipping box to return it to the manufacturer for repairs
3. A user’s manual
4. None of the above

5-3. Which of the following situations should you avoid when handling or caring for your instrument?

1. Setting up the instrument in a street
2. Removing the instrument from the case by the telescope
3. Tightening the instrument to the tripod head during setup
4. Tightening all screws to a firm bearing

5-4. What is the preferred method for carrying an instrument on a sidehill?

1. On the uphill shoulder
2. Walk the instrument on the tripod legs
3. Under the arm on the downhill side
4. On the downhill shoulder

5-5. All clamp screws should be securely tightened when an instrument is transported.

1. True
2. False

5-6. When an instrument is not in use, you should store it in what manner?

1. In the carrying case
2. Placed on a shelf in the survey locker
3. Mounted on the tripod
4. Any place that is convenient

5–7. Which of the following bags may be used to carry stakes and hubs?

1. An orange canvas bag with a shoulder strap
2. A newsboy’s bag
3. A seabag
4. Each of the above

5-8. What is the recommended method for carrying surveyor’s tacks?

1. In the tack box
2. In a pocket on the surveyor’s bag
3. Stuck in a rubber ball or piece of softwood
4. In your shirt pocket for quick access

5-9. You should NEVER carry any equipment in sheathes, pouches, or on your belt.

1. True
2. False

5-10. You have been surveying and were caught in the rain. Upon returning to the office, what should you do with the instrument?

1. Store the instrument in the carrying case
2. Blow-dry the instrument with a hair dryer
3. Wipe it down with a cloth
4. Remove it from the case and dry the instrument at room temperature

5–11. You should clean the lens of the telescope with a chamois or lint-free cloth only.

1. True
2. False

5-12. What type of oil is recommended for lubricating transits in sub-zero temperature?

1. Watch oil
2. Whale oil
3. Graphite
4. 10W-30

5–13. Which of the following sources should you consult before doing anything to an instrument?

1. Tech library
2. Senior EA
3. Manufacturer’s manual
4. Either 2 or 3 above

5-14. Why is it important to clean mud and dirt from your equipment after use?

1. To prevent rust or decay
2. For neatness
3. To keep the Chief happy

5-15. Why is it important to take good care of your equipment?

1. For inspection purposes
2. For quality work and accurate surveys
3. Both 1 and 2 above
4. For safety

5-16. Major repairs and major adjustments are among the responsibilities of the EA.

1. True
2. False

5-17. Recalibration should by done by whom?

1. The senior EA
2. The manufacturer
3. The supply department
4. The instrumentman

5-18. To make proper adjustments, the surveyor should have which of the following information?

1. The ability to tell the effect of the adjustment on other parts
2. The ability to perform tests used to determine when the instrument is out of adjustment
3. The proper sequence for making adjustments
4. Each of the above

5-19. Which of the following instrument parts is/are used to make instrument adjustments for levels?

1. Tripod head
2. Cross hairs
3. Level tubes
4. Both 2 and 3 above

5-20. The cross hairs on a telescope are out of adjustment when they fail to align with

1. the object being sited
2. one another
3. the optical axis
4. the alignment points

5-21. How do you determine if an Abney or Locke level is out of adjustment?

1. Check the reflected bubble with the instrument in a horizontal plane
2. Check the reflected bubble with the instrument in a vertical plane
3. Check the plate level bubbles

5–22. What is a general rule regarding the freguency of adjustment?

1. Check and adjust often
2. Check rarely and adjust rarely
3. Check often and adjust rarely
4. Check rarely and never adjust

5–23. You feel your instrument is out of adjustment. Which of the following procedures should you do before making any adjustments?

1. Ensure the instrument is screwed down on the tripod
2. Set the instrument up in the shade
3. Repeat the checks at least three times
4. All of the above

5–24. What type of surface should you use to set up an instrument for adjustment?

1. Asphalt
2. Chipped hardened surface
3. Sand
4. Plywood

5-25. What purpose, if any, does retightening the wing nuts on the tripod legs accomplish?

1. To prevent a possible shifting of the legs
2. To ensure the nuts did not loosen themselves
3. To keep the tripod head from moving
4. None

5-26. Most tests show an error equal to what amount of the actual displacement error?

1. Half the actual error
2. Double the actual error
3. Equal to the actual error
4. Three times the actual error

5-27. What is creep in relation to the instrument?

1. Position shift due to heat
2. Settlement of the instrument
3. Position shift due to cold
4. All of the above

5-28. The operator’s manual is your first source of information when instruments need adjustment.

1. True
2. False

5-29. You are performing a survey requiring a high degree of accuracy. Which, if any, of the following procedures should be one of the first steps you perform?

1. Check your instrument for maladjustment
2. Figure the compensation for adjustments to the instrument
3. Oil the tripod head
4. None of the above

Learning Objective: Recognize the correct test and procedures to be used in relation to an engineer’s level.

5-30. You are assigned to a survey party. You get the level along with your other equipmnet. What procedure, if any, should you perform on the instrument before starting work?

1. Check the instrument for proper adjustment
2. Adjust all the bubble tubes to the maximum angle
3. Perform a two–peg test
4. None

5-31. When adjusting a level, you should follow an exact order for making all the adjustments.

1. True
2. False

5-32. You have found the level tube out of adjustment on a level. You set the instrument up and then level the bubble over each set of leveling screws. What is your next step?

1. Rotate the instrument 90° and adjust the bubble half the distance to the center of the tube
2. Rotate the instrument 180°, check the bubble, and adjust the bubble to the center of the tube
3. Rotate the instrument 180° and adjust the bubble half the distance to the center of the tube
4. Rotate the instrument 180°, loosen the capstan screws, and rotate the reticle until the bubble is half the distance of the tube

5-33. Adjustments on a level should be made in what order?

1. Vertical cross hair, level tube, and line of sight
2. Horizontal cross hair, line of sight, and level tube
3. Level tube, line of sight, and horizontal cross hair
4. Level tube, horizontal cross hair, and line of sight

5–34. The two-peg test is used for what purpose?

1. All transit adjustments
2. Adjusting line of sight on levels
3. Aligning the vertical cross hair
4. Adjusting the line of sight on transits

5-35. How should you compensate in the field for a maladjusted level tube on a level?

1. Replace the tube
2. Balance all your shots
3. Relevel before each reading
4. Run a two-peg test after several shots

5-36. What is the recommended method, if any, for doing fieldwork when you have a maladjusted horizontal cross hair on a level?

1. Always sight on a horizontal plane
2. Use the part of the horizontal cross hair closest to the vertical cross hair
3. Use the part of the horizontal cross hair on the outside of the scope
4. None

5-37. To compensate for a maladjusted line of sight on a level in the field, you should

1. balance your foresights and backlights
2. take short foresights and long backsights
3. level the instrument after every foresight
4. reverse the rod for backsights

Learning Objective: Recognize the correct test and adjustment procedures to be used in relation to a surveyor’s transit.

5-38. Where should your transit be located when you are testing and adjusting it?

1. In the office on a desk
2. In the shade on the hood of a vehicle
3. In the shade on a tripod
4. In the shade on a workbench

5–39. You are adjusting the telescope level on a transit. When you complete this adjustment, what is your next step?

1. Check the plate bubbles
2. Recheck the telescope level
3. Check the vertical vernier
4. Begin the survey

5-40. When the plate bubbles are properly aligned on a transit, this will ensure what condition?

1. Horizontal angles are measured in a true horizontal plane
2. Vertical angles are measured in an inclined plane
3. Index error is very small
4. Plate level tubes are parallel to the vertical axis

5-41. What test should be performed every time you set up a transit?

1. Telescope level
2. Line of site
3. Plate bubbles
4. Vertical circle vernier

5–42. Which of the following situations requires the use of the vertical cross hair?

1. To lay out a fence line
2. To lay out utility poles
3. To lay out a building 90° to another building
4. Each of the above

5-43. If the line of sight is maladjusted in a transit, how do you compensate for it in the field?

1. By double centering
2. By turning multiple angles
3. By rotating the cross hairs

5–44. When you are using a transit for direct leveling and the telescope level is out of adjustment, what is the correct method of compensating?

1. Same as the engineer’s level
2. Repair it before use
3. Ignore it as it has no effect
4. Replace the telescope

5-45. To compensate for a misaligned vertical vernier, you should

1. read all vertical angles reversed only
2. read all angles horizontal only
3. read all vertical angles direct only
4. read all vertical angles direct and reversed and then use the average

5-46. The EA should make minor and major repairs to all equipment.

1. True
2. False

5-47. Equipment in need of adjustment should be adjusted at what interval?

1. Monthly
2. Weekly
3. Every 2 weeks
4. Whenever it is needed

5-48. Which of the following activities may perform minor repairs?

1. Navy cal lab
2. Local PWD
3. Battalion machine shop
4. Each of the above

Learning Objective: Identify where to find information regarding surveying equipment and supply requirements for a battalion.

5-49. When a piece of equipment is damaged beyond repair, it must be replaced. You may obtain a replacement from what source?

1. PWD
2. Equipment manufacturer
3. Army/Navy surplus store
4. Navy supply system

5-50. What source/reference determines the maximum number of any item allowed in a battalion?

1. The supply department
2. Table of Allowance
3. An authorization list
4. The naval supply depot

5-51. Which of the following sources should you refer to when checking on the quantity of surveying kits in a battalion?

1. Table of Allowance
2. 80010 inventory list
3. *Military Requirements for Petty Officer Third Class*
4. NAVFAC P-315

ASSIGNMENT 6

Textbook Assignment: "Indirect Leveling/Level and Traverse Computations." Page 7-1 through 7-30.

Learning Objective: Recognize characteristics and procedures associated with barometric and trigonometric leveling and compute elevations.

6–1. Barometric leveling is used to measure the difference in elevations by which of the following methods?

1. By measuring the slope angle
2. By measuring the atmospheric pressure
3. By measuring the slope distance
4. By measuring the vertical offset

6-2. Barometric leveling is used mostly in which of the following types of surveys?

1. Layout
2. Route
3. Reconnaissance
4. Navigational

6-3. The minimum number of altimeters required for a two-base method of barometric leveling is

1. five
2. two
3. three
4. four

6-4. Barometric leveling should be performed at what time of day?

1. Midday
2. 2 to 4 hours before sunrise or 2 to 4 hours after sunset
3. 2 to 4 hours after sunrise or 2 to 4 hours before sunset
4. 2 to 4 hours before sunset or 2 to 4 hours after sunset

6-5. You are to determine the difference in elevation between two points by trigonometric leveling. In doing so, you should measure

1. the horizontal distance and the azimuth angle
2. the vertical angle and then take the stadia intercept
3. the vertical and azimuth angle and then take the rod reading
4. the slope distance and then take the stadia intercept

6-6. When the horizontal distance is measured, what trigonometric function is used to help determine the difference in elevation?

1. Cosecant
2. Secant
3. Tangent
4. Cotangent

6-7. When the slope distance is measured, what trigonometric function is used to help determine the difference in elevation?

1. Tangent
2. Cosine
3. Sine
4. Cotangent

6-8. When the horizontal or slope distance is measured by chaining, which of the following corrections must be computed before you determine the difference of elevation?

1. Repair adjustment, sag, and temperature
2. Standard error, sag, and tension
3. Sag, temperature, and standard error
4. Tension, heat, and number of movements

6-9. When you do trigonometric leveling with an electronic distancing measuring device, what other instrument is used to measure your angles?

1. Transit
2. Theodolite
3. Level
4. Alidade

6-10. Before beginning computations based on your field notes, you should perform which of the following actions?

1. Reduce slope measurements
2. Reduce angles to mean angles
3. Check notes for completeness
4. Each of the above

6-11. When you are discussing computations, the term *adjustment* refers to

1. fudging of the numbers
2. alignment of columns
3. equal distribution of the total error

6-12. What are you verifying by checking the difference in foresights and backsights?

1. Balanced foresights and backsights
2. Arithmetic accuracy
3. Error of closure
4. BM elevation

6-13. The term *error of closure* is defined as the difference between

1. the beginning elevation and the ending elevation of two different points
2. the beginning elevation and ending elevation of a level loop
3. the ending elevation of a level circuit and measured elevation of that point

6-14. Since the error of closure is distributed proportionally, what information must be obtained while running the level loop or circuit?

1. Distance of foresights and backsights
2. Distance of foresights only
3. Distance of backsights only
4. Temperature and humidity

6-15. You have just completed a level circuit run of 2,640 feet. The error of closure was .021 feet. What order of precision is this leveling work?

1. First
2. Second
3. Third
4. Fourth

6-16. When adjusting a level net, you adjust each leg only once, regardless of a leg being in more than one circuit.

1. True
2. False

6-17. The terms *elevation angle* and *depression angle* refer to which of the following situations

1. The rod location in relation to the instrument
2. The value of the vertical angle
3. The instrument location in relation to the rod
4. Each of the above

6-18. In first- or second-order leveling, which of the following statements is true?

1. These level circuits never close on themselves
2. The actual distance leveled is the length of the circuit
3. These level circuits close on the beginning bench mark
4. These circuits are less precise than third-order level circuits

Rod EA2 PISTOL
EA3 DOOR
EA3 BOAT

LEVEL CIRCUIT FROM B.M. 35 to B.M. 19

B & B Dumpy #31057

STA.	B.S.+	H.I.	F.S.−	ELEV	SIGHTS							
					B.S.	F.S.		JUNE 30	3 HRS			
B.M. 35	6.35			100.02	220			CONCRETE	MONUMENT	BM		
⊖ 16	4.66		4.67		250	220		PEG				
⊖ 17	4.20		7.15		310	250		PEG				
⊖ 18	1.11		5.55		100	310		PEG				
TP 1	6.77		0.98		190	100		ROCK OUTCROP	TURNING	POINT		
B.M. 19			1.48			190		CONCRETE	MONUMENT	BM =	103.20	

Figure 6A

IN ANSWERING QUESTIONS 6-19 THROUGH 6-23, REFER TO FIGURE 6A.

6-19. What is the error of closure of the level circuit?

1. -0.08
2. +0. 08
3. -3.26
4. +3.26

6-20. What is the distance form (a) BM 16 to BM 17 and (b) the total adjustment applied to the computed elevation?

1. (a) 990 ft (b) 0.01 ft
2. (a) 990 ft (b) 0.07 ft
3. (a) 500 ft (b) 0.01 ft
4. (a) 500 ft (b) 0.07 ft

6-21. What is the adjusted elevation of TP 1?

1. 97.98
2. 98.00
3. 97.92
4. 98.06

6-22. This level circuit meets the requirements for third-order work.

1. True
2. False

6-23. This level circuit was conducted according to the requirements for first-order or second–order work.

1. True
2. False

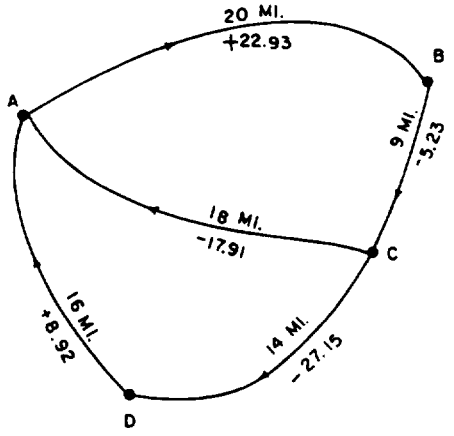

Figure 6B

IN ANSWERING QUESTIONS 6-24 THROUGH 6-30, REFER TO FIGURE 6B.

6-24. If you adjust the level net ABCDA, the adjustment of the level circuit will affect the adjustment of the level circuit ACDA.

1. True
2. False

6-25. What is the error of closure (E_c) in level circuit ABCA?

1. -0.21
2. +0.21
3. -0.32
4. +0. 32

6-26. What is the corrected difference of elevation (Corr DE) for line AB (cycle I)?

1. -23.02
2. +23.02
3. -21.84
4. +21.84

6-27. What is the corrected difference in elevation (cycle I) for line CA?

1. +17.83
2. -17.83
3. +17.91
4. -17.91

6-28. What is the value of the difference in elevation of line AC that you will use to adjust level circuit ACDA?

1. +17.83
2. -17.83
3. +17.91
4. -17.91

6-29. What is the corrected elevation of line AC in level circuit ACDA?

1. +17.83
2. -17.83
3. +17.93
4. -17.93

6-30. What is the corrected difference in elevation for line DA?

1. +9.08
2. -9.08
3. +8.92
4. -8.92

Learning Objective: Perform traverse computation in such areas as adjusting angles, locating a point horizontally by its plane coordinates, figuring error of closure, closing a traverse, calculating departure of a traverse, and adjusting bearings and distances.

6-31. What is the first step in traverse computations?

1. Calculating mean angles
2. Checking notes for all data
3. Correcting distance measurements
4. Verifying the crew members

6-32. Distribution of angular error of closure is performed

1. proportionally by angle size
2. proportionally by distance between angles
3. equally among all angles
4. subtracting the error from all angles

IN ANSWERING QUESTIONS 6-33 THROUGH 6-35, USE THE FOLLOWING INFORMATION. YOU HAVE MEASURED A CLOSED TRAVERSE HAVING FOUR ANGLES. THE SUM OF THE LEFT DEFLECTION ANGLES EQUALS 435°03′00″, AND THE SUM OF THE RIGHT DEFLECTION ANGLES EQUALS 75°01′12″.

6-33. What is the sum of the exterior angles?

1. 360°
2. 510°
3. 1,080°
4. 1,260°

6-34. What is the angular error of closure?

1. -01′12″
2. +01′12″
3. -01′48″
4. +01′48″

6-35. How is the amount of adjustment distributed among the angles?

1. By subtracting 27″ from the right deflection angles only
2. By adding 27″ to the right deflection angles and by subtracting 27″ from the left deflection angles
3. By subtracting 27″ from each angle
4. By adding 27″ to each deflection angle

6-36. You are giving the location by plane coordinates of a point. In what terms should you give the location of that point in relation to the point of origin?

1. Its distance east
2. Its distance south
3. Its distance north or south and the distance east or west
4. Its distance south and west

6-37. What is the latitude of a 100-foot-long traverse line running due east?

1. 0 ft
2. 1 ft
3. 50 ft
4. 100 ft

6-38. What is the departure of a 100-foot-long traverse line with bearing N 40°E?

1. 100 ft
2. 100 ft cos 40°
3. 100 ft sin 40°
4. 100 ft tan 40°

6-39. A positive latitude and a negative departure characterize a traverse line bearing

1. NE
2. NW
3. SE
4. SW

6-40. The linear error of closure is determined by

1. the sum of the departures
2. the difference in the departures and latitudes
3. the error of latitude
4. the use of the Pythagorean theorem with error of closure in latitude and departure

6-41. What is the most commnon method of balancing a traverse?

1. Rule of thumb
2. Compass rule
3. Closure rule
4. Grid rule

IN ANSWERING QUESTIONS 6-42 THROUGH 6-44, USE THE FOLLOWING INFORMATION.

TOTAL LENGTH OF TRAVERSE = 2,541.35
ERROR OF CLOSURE IN LATITUDE = -1.73
ERROR OF CLOSURE IN DEPARTURE = +2.01

6-42. What is the linear error of closure?

1. 0.24 ft
2. 0.57 ft
3. 1.93 ft
4. 2.65 ft

6-43. What is the ratio of error of closure?

1. 1/959
2. 1/1320
3. 1/4500
4. 1/10600

6-44. What is the corrected latitude for a traverse line of 485.35 ft with a bearing of N 35°30′E?

1. +394 .80
2. +395.13
3. +395.39
4. +395.46

IN ANSWERING QUESTION 6-45, REFER TO FIGURE 7–15.

6-45. Compute the departure of a traverse line 647.85 feet long, bearing N 15°45′W.

1. -613.56
2. +613.56
3. -175.89
4. +175.89

6-46. What is meant by the term *inversing?*

1. Computing the latitude and departure of a traverse line from its bearing and length
2. Computing the bearing and length of a traverse line from its latitude and departure
3. Computing the ratio of linear error of closure of a traverse from its length and error of closure
4. Computing the latitude and departure from the corrected angles and distances

6-47. Plane coordinates describe the location of a point in what manner?

1. By a distance north or south and east or west from a point of origin
2. By bearing north or south and east or west from a point of origin
3. By bearing and distance from a point of origin
4. By the line of sight from a point of origin

Learning Objective: Compute coordinates from latitude and departure; compute latitude and departures from coordinates.

IN ANSWERING QUESTIONS 6-48 THROUGH 6-50, ASSUME THAT A TRAVERSE LINE HAS THE FOLLOWING PLANE COORDINATES

STATION A X = 627.42 Y = 326.87

STATION B X = 864.81 Y = 542.50

6-48. What is the latitude of the traverse line?

1. -215.63 ft
2. +215.63 ft
3. -237.39 ft
4. +237.39 ft

6-49. What is the departure of the traverse line?

1. -215.63 ft
2. +215.63 ft
3. -237.39 ft
4. +237.39 ft

6-50. What is the bearing of the traverse line?

1. N47°45′E
2. N42°15′E
3. S47°45′W
4. S42°15′W

POINT	LATITUDE		DEPARTURE		COORDINATES	
	NORTH	SOUTH	EAST	WEST	Y	X
A					50.75	120.47
	202.56		41.55			
B						
		170.15		145.84		
C						
		32.41	104.29			
A					50.75	120.47

Figure 6C

IN ANSWERING QUESTIONS 6-51 AND 6-52. REFER TO FIGURE 6C. THE FIGURE SHOWS THE ADJUSTED LATITUDES AND DEPARTURES OF STATIONS A, B, AND C OF A CLOSED TRAVERSE. IT ALSO SHOWS THE PLANE COORDINATES OF STATION A.

6-51. What are the plane coordinates of station B?

1. Y = 248.28 X = 156.04
2. Y = 250.32 X = 158.22
3. Y = 253.31 X = 160.88
4. Y = 253.31 X = 162.02

6-52. What are the plane coordinates of station C?

1. Y = 83.16 X = 14.32
2. Y = 83.16 X = 16.18
3. Y = 85.24 X = 16.18
4. Y = 85.24 X = 14.32

Learning Objective: Compute areas by double meridian distance. double parallel distance, from coordinates, by trapezoidal formula, by counting squares, and by planimeter. Compute meridian and double meridian distance. Compute areas by segmented and external parcels.

6-53. The reference meridian passes through what traverse station?

1. Most easterly
2. Most westerly
3. Most northerly
4. Most southerly

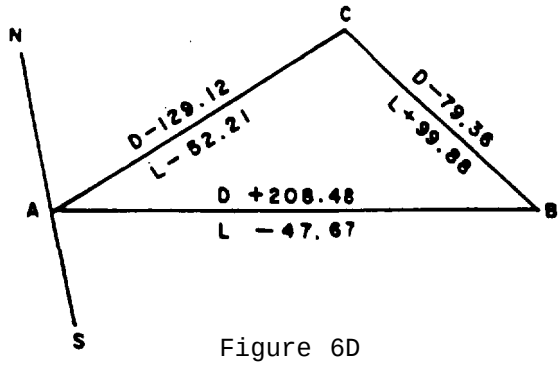

Figure 6D

IN ANSWERING QUESTIONS 6-54 THROUGH 6-56, REFER TO THE FIGURE 6D. THE INITIAL TRAVERSE LINE IS *AB* AND THE SUBSEQUENT TRAVERSE LINES ARE *BC* AND *CA.* RESPECTIVELY.

6-54. What is the meridian distance of traverse line *BC?*

1. 79.36 ft
2. 104.24 ft
3. 143.92 ft
4. 168.80 ft

6-55. What is the double meridian distance of traverse line *CA?*

1. 337.60 ft
2. 258.24 ft
3. 129.12 ft
4. 79.36 ft

6-56. What is the approximate area contained within the closed traverse?

1. 8,520 sq ft
2. 17,040 sq ft
3. 25,200 sq ft
4. 50,400 sq ft

6-57. What is the major difference between the DMD method of determining area and the DPD method?

1. The DPD of the initial traverse line is twice the departure
2. A reference parallel is used instead of a reference meridian
3. The distances are calculated using latitude instead of departure
4. Both 2 and 3 above

STATION	COORDINATES	
	Y	X
A	20 FT	10 FT
B	30 FT	0 FT
C	25 FT	20 FT

FIGURE 6E

IN ANSWERING QUESTION 6-58, REFER TO FIGURE 6E.

6-58. The coordinates of stations *A, B,* and *C* of a closed straight-sided traverse are given. What is the area contained within the closed traverse?

1. 75 sq ft
2. 100 sq ft
3. 125 sq ft
4. 150 sq ft

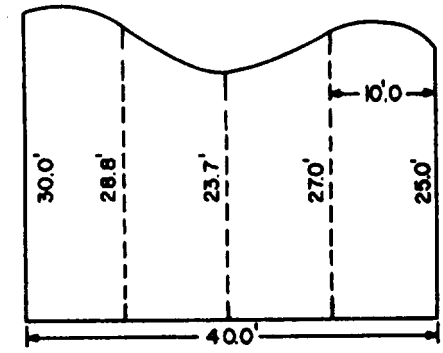

Figure 6F

IN ANSWERING QUESTIONS 6-59 AND 6-60, REFER TO FIGURE 6F.

6-59. Using the trapezoidal rule, the area of the figure equals

1. $10\left(\frac{30 + 28.8 + 23.7 + 27 + 25}{5}\right)$
2. $10\left(\frac{28.8 + 23.7 + 27}{3} + 30 + 25\right)$
3. $10\left(\frac{30 + 25}{2} + 28.8 + 23.7 + 27\right)$
4. $40\left(\frac{30 + 28.8 + 23.7 + 27 + 25}{2}\right)$

6-60. What is the initial step in finding the area of the figure by counting squares?

1. Plot it to scale on graph paper
2. Use a planimeter to determine the area
3. Divide it into 100-foot squares
4. Determine the bearings of the lines

6-61. You have a planimeter but do not know the constant for the instrument. How may you determine an area with this instrument?

1. By measuring the drum
2. By measuring a known area of the same scale and establishing a ratio
3. By measuring the area you want to know and calculate using the drawing scale

6-62. Once you have determined the segmental areas, what do you do with this information to find the area of the whole parcel?

1. Always subtract the areas from the area of the parcel
2. Always add the areas to the area of the parcel
3. Determine if the segmental areas are inside or outside the parcel straight-line and chord boundaries, then add or subtract as required

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Learning Objective: Recognize correct procedures for plotting angles by the protractor-and-scale method, tangents, and coordinates.

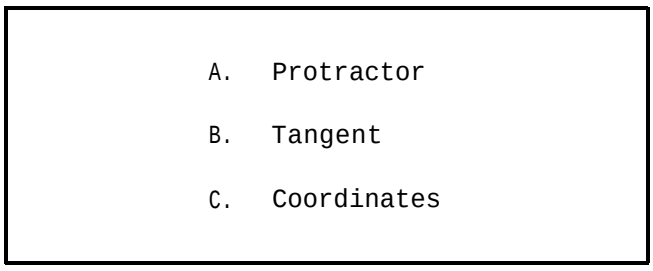

Figure 6G

IN ANSWERING QUESTIONS 6-63 THROUGH 6-66, SELECT FROM FIGURE 6G THE METHOD OF PLOTTING TRAVERSES THAT IS BEST DEFINED BY THE QUESTIONS. SOME RESPONSES MAY BE USED MORE THAN ONCE.

6-63. This method uses a *NS* meridian to lay out each angle.

1. A
2. B
3. C

6-64. This method uses linear distances from reference lines, locates points, and then connects them with lines.

1. A
2. B
3. C

6-65. This method uses deflection angles and a reference meridian.

1. A
2. B
3. C

6-66. This method uses a single meridian to lay out each bearing line. Then you use parallel lines to transfer these directions to the plot.

1. A
2. B
3. C

Learning Objective: Identify surveying computation mistakes, their causes, and methods to correct them. Also, identify ways to prevent future mistakes.

6-67. A bearing that has the correct angular value, but the wrong compass direction is usually caused by which of the following surveying mistakes?

1. Viewing the direction of a traverse line from the wrong station
2. Dropping a traverse line
3. Taking a reading from a wrong column of a traverse table
4. Omitting the plus or minus sign of a written value

6-68. You may prevent direction error by

1. placing directional arrows on the traverse diagram
2. quickly adding up the angles to ensure the traverse lines were not dropped
3. making both readings and field note entries with deliberation
4. never writing a value without including the appropriate sign

6-69. Which of the follwing errors uses the same prevention method as direction error prevention?

1. Dropped signs
2. Dropped traverse lines
3. Wrong azimuths
4. Missing decimal points

6-70. When you have an outsized linear error of closure, what should you check first?

1. Your latitudes and departures are correct
2. A dropped traverse line
3. Your arithmetic
4. The bearings computations

6-71. In your traverse containing five interior angles, you compute a final sum of the angles of 500°. What mistake, if any, was probably made?

1. One of the angles was probably dropped, since the sum of the angles should be 540°
2. The angles were probably added incorrectly, since the sum should be 360°
3. You will have to return to the field to find the mistake
4. None

6-72. After you check computations and ensure that no angle was dropped in the process, you still have a large error of closure. What further check, if any, should you attempt at this time?

1. See if an angle is exactly equal to the error of closure; if so, there is a deflection angle error
2. Construct a perpendicular bisector from the line of the linear error of closure to indicate possibly the erroneous measurement involved
3. Construct a line parallel to the suspected erroneous line to find the error
4. None; you must return to the field

6-73. When you have an outsized error of closure for latitudes but not departures, what should you check?

1. A mistake in an angle
2. A mistake in a distance
3. An arithmetic error
4. A dropped traverse line

6-74. When you have an outsize linear error of closure but an acceptable angular error of closure, you should check to see whether you used the

1. sine of the bearing when finding the latitude of the course
2. sine of the bearing when finding the departure of the course
3. cosine of the bearing when finding the departure of the course
4. tangent of the bearing when finding the latitude of the course

6-75. You cannot locate your error and the traverse will not close. You must rerun the traverse, so where should you begin?

1. With a traverse line parallel to the linear error of closure
2. With the initial traverse line
3. With the final traverse line
4. With a line perpendicular to the line of linear closure at its midpoint

ASSIGNMENT 7

Textbook Assignment: "Topographic Surveying and Mapping." Pages 8-1 through 8-24.

Learning Objective: Recognize procedures and definitions associated with horizontal and vertical control.

7-1. Which of the following elements is representative of topographic maps?

1. The earth's surface
2. The earth's natural features
3. The man-made features
4. Each of the above

7-2. Topographic map information is obtained in what manner?

1. From photographs
2. From other maps
3. By a topographic survey
4. By observation from aircraft

7-3. Control points are located in what manner?

1. By triangulation only
2. By traversing only
3. Both 1 and 2 above
4. By indirect leveling

7–4. In a topographic survey of an area, what kind of control is established by crossties from one side of the area to another?

1. Primary
2. Secondary
3. Horizontal
4. Vertical

7-5. Vertical control is normally established by which of the following means?

1. Direct leveling
2. Trigonometric leveling
3. Barometric leveling
4. Indirect leveling

Learning Objective: Recognize procedures used in locating topographic details by the transit-tape method and the transit-stadia method. Compute horizontal distances and elevations.

7-6. When topographic maps require a high degree of accuracy, what method of finding detai1s is recommended?

1. Transit and tape
2. Transit and stadia
3. Transit and trigonometric leveling
4. EDM and level

7-7. When time is more critical than a high degree of accuracy, what method of locating details is recommended?

1. Transit and tape
2. Transit and stadia
3. Transit and trigonometric leveling
4. EDM and level

7-8. Which of the following actions should you take to avoid overcrowding and confusion when sketching details during fieldwork?

1. Use azimuths instead of deflection angles
2. Use numbers and legends for a large number of details
3. Both 1 and 2 above
4. Estimate distances and angles

7-9. The stadia method provides horizontal distances of a higher precision than those obtained by taping, EDM, or differential leveling.

1. True
2. False

Learning Objective: Identify characteristics of instruments used for determining horizontal distances and elevations. Identify procedures for determining the vertical angle of a point by the transit-stadia method. Use basic terms and formulas and also perform computations that are used on topographic surveys.

7-10. Philadelphia rods should be used for stadia work for distances up to 1,500 feet.

1. True
2. False

7-11. The *stadia interval* is defined as

1. the reading on the rod between the stadia hairs
2. the distance to the stadia rod
3. the reading between the upper stadia hair and the middle cross hair
4. the reading between the lower stadia hair and the middle cross hair

7-12. When your stadia reading is more than the length of the rod, what procedure do you use?

1. Read a half-interval using the middle cross hair and then multiply the reading by 2
2. Hold two rods together
3. Make a rod in the BU shop that will be long enough
4. Shorten your sighting

7-13. Stadia distance is equal to

1. the rod reading
2. the rod reading divided by the stadia constant
3. the stadia interval
4. the stadia interval times the stadia constant

7-14. Stadia horizontal distances are normally recorded to what degree of accuracy?

1. To 0.01 ft with a target
2. To 0.1 ft over 300 ft
3. To the nearest foot
4. As close as possible

IN ANSWERING QUESTIONS 7-15 THROUGH 7-19, ASSUME THAT YOU ARE LOCATING POINTS *B* AND *C* BY THE TRANSIT-STADIA METHOD WITH THE INSTRUMENT SET UP AT STATION *A.* USE THE FOLLOWING INFORMATION:

Focal distance	=	1.00 ft
Elevation *A*	=	431.8 ft
Instrument height	=	4.5 ft
Rod reading	=	4.5 ft

POINT	ROD INTERCEPT	VERTICAL ANGLE
B	4.54	+3°18′
C	6.42	-2°44′

7-15. What is the horizontal distance *AB?*

1. 451.6 ft
2. 452.6 ft
3. 452.8 ft
4. 453.5 ft

7-16. The difference in elevation between station *A* and point *B* is

1. 26.1 ft
2. 26.2 ft
3. 26.4 ft
4. 26.6 ft

7-17. What is the elevation of point *B?*

1. 405.6 ft
2. 405.7 ft
3. 457.9 ft
4. 458.0 ft

7-18. If station *A* and points *B* and *C* are in a straight line with station *A* between points *B* and *C,* what is the distance between points *B* and *C?*

1. 640.5 ft
2. 641.5 ft
3. 1,095.0 ft
4. 1,096.0 ft

7-19. What is the difference in elevation between points *B* and *C?*

1. 56.7 ft
2. 46.3 ft
3. 30.6 ft
4. 16.5 ft

7-20. Stadia tables use a constant stadia distance of

1. 50 ft
2. 100 ft
3. 101 ft
4. 200 ft

7-21. Unequal refraction caused by the sun's rays will have what effect on your data?

1. Cause longer distances than actual to be read
2. Cause shorter distances than actual to be read
3. Cause reversed vertical angles to be read
4. Cuuse smaller vertical angles than actual to be read

7-22. How do you compensate for refraction?

1. By ignoring the instrument constant
2. By taking all readings at two different times of the day
3. By shading the instrument
4. By using the refraction compensation formula

7-23. The stadia circle provides conversion factors that are used with the stadia interval to determine vertical and horizontal distances.

1. True
2. False

7-24. How is the arc reading of a multiplier scale used in computations?

1. Multiplied by the rod intercept to obtain the stadia distance
2. Subtracted from the stadia distance
3. Added to the rod intercept and then multiplied by the stadia constant
4. Multiplied by the stadia interval to obtain the horizontal distance

7-25. The subtraction scale gives a percentage reading that is used to reduce your stadia distances to obtain the actual distances.

1. True
2. False

7-26. You are using a transit with a multiplier stadia arc. You have a 93 reading on the horizontal stadia arc with a depressed vertical angle. The rod intercept is 5.63. What is the horizontal distance?

1. 506.7 ft
2. 523.6 ft
3. 563.0 ft
4. 602.4 ft

7-27. The elevation of station *A* is 325.5 ft and the HI is 329.7 ft. You are sighted on point *B.* You have a -7 reading on the vertical stadia arc, a rod reading of 4.2, and a rod intercept of 5.1. What is the elevation of point *B?*

1. 289.8 ft
2. 318.8 ft
3. 361.2 ft
4. 372.9 ft

7-28. The Beaman stadia arc uses which of the following methods to determine horizontal distances?

1. Multiplier scale
2. Addition scale
3. Indirect scale
4. Subtraction scale

7-29. The rod intercept is 3.75 for point *B.* The **H** scale on the Beaman arc reads 10. What is the horizontal distance from the instrument to point *B?*

1. 337.5 ft
2. 371.3 ft
3. 378.8 ft
4. 412.5 ft

7-30. You have a reading of 80 on the **V** scale of the Beaman stadia arc. The rod intercept is 3.75. What is the difference in elevation between the instrument and the point sighted?

1. -10.25 ft
2. +10.25 ft
3. -30.00 ft
4. +30.00 ft

7-31. Which of the following procedures should you follow in determining the vertical angle of a point in a transit-stadia method?

1. Read the angle when the lower stadia hair intercepts the graduation mark on the stadia rod that corresponds to the actual HI above the ground surface
2. Read the angle when the upper stadia hair intercepts the graduation mark on the stadia rod that corresponds to the actual HI
3. Read the angle when the horizontal stadia hair intercepts the graduation mark on the stadia rod that corresponds to the actual HI above the ground surface
4. Read the angle when the vertical stadia hair intercepts the graduation mark on the stadia rod that corresponds to the actual HI above the ground surface

7-32. What method is used to determine the instrument height?

1. Take a rod reading on the point before the instrument setup
2. Use a tape or rod to measure the height after setting up over the point
3. Use balanced foresights and backsights and then obtain an average
4. Set the instrument up to your eye alignment

IN ANSWERING QUESTIONS 7-33 THROUGH 7-36, REFER TO APPENDIX II, TABLE AII-3. ALSO USE THE FOLLOWING INFORMATION:

Elevation station *A* =	525.3 ft
Rod reading on point *B*	4.3
HI	4.3 ft
Stadia interval	6.1
Vertical angle to *B*	+5°20′
Focal length	0.75

7-33. What is the multiplier used to find the horizontal distance?

1. 99.14
2. 98.78
3. 99.43
4. 9.25

7-34. What is the horizontal distance from station *A* to point *B?*

1. 615.2 ft
2. 610.0 ft
3. 604.8 ft
4. 56.4 ft

7-35. What is the difference in elevation between station *A* and point *B?*

1. 5.64 ft
2. 6.10 ft
3. 56.40 ft
4. 604.80 ft

7-36. What correction factor do you apply to the elevation for the focal length?

1. Add 1.00 ft to the elevation
2. Add 0.75 ft to the elevation
3. Add 0.09 ft to the elevation
4. Add 0.07 ft to the elevation

Learning Objective: Identify the purpose of contour lines and identify definitions of related terms. Recognize procedures for using and interpreting contour lines; recognize the procedure for interpolating contour lines.

7-37. *Relief,* as applies to surveying, is defined as

1. the difference in elevation
2. variation in the features of the earth's surface
3. variation of natural features of the earth's surface
4. man-made variations of the earth's surface

7-38. Which of the following methods are used for relief maps?

1. 3-D models
2. Hachure lines
3. Shading representing shadows
4. Each of the above

7-39. On a map, a line that represents the same elevation for all points on the line is called a/an

1. contour line
2. elevation line
3. hachure line
4. grid line

7-40. Contour lines are used to show what type of information on a topographic map?

1. The guickest route
2. Boundaries
3. Rivers and streams
4. Relief

7-41. What is the difference between the values of adjacent contour lines called?

1. Index contour
2. Contour interval
3. Intermediate contour
4. Elevation interval

7-42. During a topographic survey, the actual contour points on the ground are located and plotted. This system is called

1. cross profiles
2. control points
3. grid control
4. tracing contours

7-43. The grid coordinate system works best on what type of features?

1. Slopes
2. Relatively level ground
3. Valleys
4. Shorelines and cliffs

7-44. Two points, *A* and *B,* are 125 feet apart. A 100-foot contour passes through point *A* and a 125-foot contour passes through point *B* and the slope is uniform. How far from point *A,* to scale, should you interpolate the 115-foot contour?

1. 15 ft
2. 50 ft
3. 75 ft
4. 115 ft

7-45. When drawing contour lines by using control points, what must you do to locate contour lines?

1. Scale
2. Interpolate
3. Average
4. Randomize

7-46. An area on a topographic map where contour lines are evenly spaced and wide apart represents a

1. valley
2. gentle, uniform slope
3. steep, uniform slope
4. ridge

7-47. In what direction does the curve of a contour line cross a stream?

1. Upstream
2. Westward
3. Downstream
4. Eastward

7-48. Contour lines represent what in relation to the earth's surface?

1. Horizontal planes
2. Vertical planes
3. Grid lines
4. Different points of elevation

7-49. A panoramic sketch shows the terrain in what manner?

1. In contour lines
2. In elevation
3. In perspective
4. Both 2 and 3 above

Learning Objective: Recognize appropriate scale for topographic maps; identify correct design and placement of topographic specifications.

7-50. Which of the following scales represent a large-scale topographic map?

1. 1 in. = 50 ft
2. 1 in. = 120 ft
3. 1 in. = 500 ft
4. 1 in. = 1,000 ft

7-51. Which of the following contour intervals should you use to prepare an intermediate-scale map of a hill?

1. 1 ft
2. 2 ft
3. 10 ft
4. 20 ft

7-52. Which of the following operations is NOT one of the basic operations for construction of a topographic map?

1. Plotting horizontal control
2. Plotting details and ground points
3. Determining slope distances
4. Drawing contour lines

7-53. What lines are drawn before the actual contour lines are plotted on a topographic map?

1. Spur and ridge lines
2. Vertical control and spur lines
3. Spur and valley lines
4. Ridge and valley lines

7-54. For clarity on small-scale maps, how should buildings and other features be shown?

1. To scale
2. Larger than scale and true to shape
3. Larger than scale and by symbols
4. By location in the notes

7-55. Which of the following devices is useful for interpolating contour lines rapidly?

1. Engineer’s scale
2. Tracing cloth
3. Graduated rubber band
4. Each of the above

7-56. Topographic maps used for the design of construction drawings normally use what contour interval?

1. 1 or 2 ft
2. 1, 2, or 5 ft
3. 10 ft
4. 20 ft

7-57. Topographic maps used for preliminary site planning show which of the following features?

1. Only man-made
2. Only natural
3. Only minor
4. Each of the above

ASSIGNMENT 8

Textbook Assignment: “Plane Table Topography and Map Projection.” Pages 9-1 through 9-23.

Learning Objective: Describe the methods and procedures used to locate topographic details in the field and to produce a topographic map using a plane table and alidade.

8-1. Surveyors prefer the plane-table method for which of the following reasons?

1. Provides a nearly complete map
2. Works well in poor lighting
3. Requires the least amount of equipment
4. Provides quick setup and easy movement

8-2. The plane table method is advantageous under which of the following conditions?

1. Surveying hilly terrain
2. Drawing a large-scale map
3. Plotting a large number of irregular lines in open country
4. Working in a very humid climate

8-3. The note keeper on a plane-table survey party is responsible for what tasks?

1. All computations
2. Preparing the sketches
3. Assisting the rodman
4. Operating the alidade

8-4. What type of alidade is preferred for topography?

1. Open sight
2. Telescopic
3. Self-leveling
4. Direct reading

8-5. The term *table orientation* is defined by which of the following statements ?

1. Table alignment and orientation
2. Sight and point alignment using the alidade blade
3. Scope orientation with paper rotation
4. Table rotation and eye alignment

8-6. What method of marking your point on your sketch is recommended?

1. Use the decimal point in your horizontal distance
2. Use the ⊙ symbol
3. Use an “X”
4. Use the decimal point of the elevation

8-7. Orientation by backsighting is accomplished by what method?

1. By sighting on an established bench mark
2. By plotting a traverse line once you set up
3. By using a plotted established line
4. By balancing all your shots

8-8. Orientating the plane table by compass is recommended for what type of mapping?

1. Accurate small scale
2. Accurate large scale
3. Rough large scale
4. Rough small scale

8-9. Which of the following items may affect the orientation of the plane table by compass?

1. Local attraction
2. The earth’s magnetic field
3. Both 2 and 3 above
4. Electrical parallax

8-10. Orientation of the plane table by resection requires the instrument to be set up over one of the points used .

1. True
2. False

8-11. The two-point method of resection refers to using two known points without setting up on either point to align the plane table.

1. True
2. False

8-12. The three-point method is used when you have three known points that

1. cannot be seen from all points
2. are aligned
3. cannot be conveniently occupied
4. are outside the triangle of error

8-13. Using the three-point method, the table is not normally aligned on the first attempt. This misalignment causes what situation?

1. Triangle of closure
2. Triangle of error
3. Pythagorean triangle
4. Open triangle

8-14. In the three-point method certain conditions must be met. Which of the following statements is one of the conditions?

1. The point will not be on the same side of all the rays
2. If the error is inside your triangle, the point will be outside the triangle
3. The point will fall to the left of all rays or right of all rays
4. The point is located by bisecting perpendicular lines

8-15. The tracing-cloth method is an example of which of the following types of orientation?

1. Backsighting
2. Compass
3. Two point
4. Resection

8-16. Horizontal location of points may be performed by resection. How, if at all, does location by resection differ from resectioning in orientation?

1. Requires more points
2. Requires occupying a known point
3. Requires more backsights
4. No difference

8-17. Intersection method of surveying is accomplished by which of the following techniques?

1. Set up on unknown points, sight the known points, and then draw plotting rays on the table
2. Set up on known points, sight a unknown point, and then establish it as a known point for the next setup
3. Set up on known points, sight the unknown point, and then draw rays from the known points to plot the unknown point
4. Set up at an known point, sight on the known point, and then measure the angles and distance

8-18. Why is it important to identify points when locating them with radiation rays?

1. They may appear differently from other points resulting in improper sightings
2. You are sighting multiple points from each point and could miss a point
3. You want to ensure proper point verification
4. You need to have proper tie-in to the progressive traverse

8-19. The progressive method of horizontal location is performed in what manner?

1. Establishing several known points from one setup
2. Establishing an unknown point as a known point by alignment and distance for use as the next point
3. Establishing an unknown point as a known point from several previously known points
4. Using an existing traverse to plot all points for the topographic map

8-20. Which of the following advantages apply to plane-table surveying?

1. Errors in measurements are easily checked
2. It reduces the possibility of overlooking important data
3. It combines data collection and the drafting operation
4. Each of the above

8-21. In comparison with the transit-stadia method, how many points are used in the plane-table method for the same degree of accuracy?

1. More points
2. Less points
3. The same amount

8-22. Which of the following disadvantages apply to the plane-table method?

1. Unsuitable for wooded areas
2. Adverse weather conditions
3. More difficult to transport the equipment
4. All of the above

8-23. What method is recommended to keep the blade aligned with the occupied point?

1. Use two triangles to draw a parallel line with the telescope straightedge
2. Use a pin as a pivot point
3. Use two triangles to pivot around a pin
4. Clamp the blade in place

8-24. What is the purpose of using buff or green detail paper?

1. Provides a good background
2. Reduces the glare
3. Absorbs the ink to reduce runs
4. Reproduces well

8-25. In maintaining the plane-table drawing, you should follow which of the following drafting practices?

1. Clean the paper at the end of the day to remove graphite
2. Use a soft lead pencil to prevent smudging
3. Lift the blade when moving it to prevent smudging
4. All of the above

8-26. A possible source of error in your plane-table work is

1. the sights are too short for accurate sketching
2. too few points for good sketching
3. the use of aerial photographs
4. the use of the same points to locate details and contours

8-27. You should ensure which of the following conditions are met to keep mistakes and errors in plane-table work to a minimum?

1. Table is level
2. Orientation is maintained
3. Both 2 and 3 above
4. Perform traverse and detailing simultaneously

8-28. In developing a topographic map, you do NOT need to consider any elevations or utilities outside the survey area.

1. True
2. False

8-29. The first step in developing a topographic map is to

1. perform a reconnaissance survey
2. run a traverse
3. gather all available maps and other pertinent data
4. perform a plane-table survey

8-30. When performing the reconnaissance survey, what task should you be thinking about when planning a plane-table survey?

1. Appropriate setup points
2. Sufficient number of stations
3. Both 2 and 3 above
4. Length of the traverse run

8-31. Traverse stations should be numbered in what manner on the plane-table sheets?

1. In ascending order clockwise
2. In ascending order counterclockwise
3. Same as the stakes in the field
4. In the order each station is reached

8-32. The plane-table work is the final step in the fieldwork.

1. True
2. False

8-33. When you are establishing horizontal control, what other method besides random traversing may be used?

1. Grids
2. Sextant
3. Transit and level
4. Theodolite

8-34. How many base lines should you establish for a grid network?

1. Five
2. Two
3. Three
4. Four

8-35. When surveying along a shoreline and there is no established trench mark, which of the following actions should you take to establish a temporary datum?

1. Take rod readings at hourly intervals
2. Take rod readings at high and low tide, then average
3. Set up a tide gauge
4. Establish a TBM at the waterline

Learning Objective: Identify and interpret Mercator, transverse Mercator projections, and military maps.

A. Mercator

B. Conic

C. Gnomonic

Figure 8A

IN ANSWERING QUESTIONS 8-36 AND 8-37, USE THE TERMS IN FIGURE 8A.

8-36. The earth’s surface is projected on a plane tangent to the equator in this type of projection.

1. A
2. B
3. C

8-37. The earth’s surface is projected onto a cylinder in this type of projection.

1. A
2. B
3. C

8-38. A Mercator projection increases distortion as you move in what direction?

1. East or west from 0° longitude
2. South of the Arctic circle
3. North of Antarctica
4. North or south from the equator

8-39. Standard Mercator projections provide excellent data of the polar regions.

1. True
2. False

8-40. A transverse Mercator projection is a Mercator projection that is altered in what manner?

1. Rotated to tangent to the Tropic of Cancer
2. Rotated 45° to lessen the distortion of the higher latitudes
3. Rotated 90° tangent to a meridian
4. Altered to show all features in the proper prospective

8-41. The military grid system is derived for what projection?

1. Conic
2. Mercator
3. Transverse Mercator
4. Gnomonic

8-42. On the globe the parallels become shorter towards the poles. Their length is proportionate to what?

1. Sine of the parallel
2. Cosine of the parallel
3. Sine of the latitude
4. Cosine of the latitude

8-43. The basic arrangement of grids based on the transverse Mercator projection is divided in what manner between latitude 80°S and 84°N?

1. 6° longitude by 8° latitude zones
2. 100,000-meter squares
3. 8° longitude by 6° latitude zones
4. 6° longitude by 12° latitude zones

8-44. In a transverse Mercator grid system, each polar region is divided in what manner?

1. Same as all other regions
2. Into two zones
3. Into 100,000-meter squares
4. Zones A and B

8-45. In a grid system, each 100,000-meter square is divided into (a) how many columns and (b) designated in what manner?

1. (a) 6 (b) numbered 0 through 9
2. (a) 6 (b) lettered A through Z with I and 0 omitted
3. (a) 8 (b) lettered A through Z with I and 0 omitted
4. (a) 12 (b) alphanumeric

8-46. What value is assigned to the equator to prevent dealing with negative values south of the equator?

1. 10,000,000 meters and the value increases toward the South Pole
2. 10,000,000 meters and the value decreases toward the South Pole
3. 500,000 meters and the value increases toward the South Pole
4. 500,000 meters and the value decreases toward the South Pole

8-47. The value assigned to the central meridian to prevent dealing with westerly values is called

1. a false easterly value
2. a false westerly value
3. a false northing value
4. a false southing value

8-48. You are using a military grid map and you provide a six-digit coordinate for a location. How accurately have you located this point?

1. Within a 1000-meter square
2. Within a 100-meter square
3. Within a 10-meter square
4. Within a 1-meter square

8-49. Figures 9-18 and 9-19 show some of the marginal information of the frid map. Which of the following items are part of the marginal information?

1. Index to state boundaries
2. Latitude and longitude of the SW corner of the grid map
3. Both 1 and 2 above
4. Grid north

Learning Objective: Identify concepts of conic, gnomonic, and polyconic projections. Recognize characteristics of conformality.

8-50. In figure 9-20, what point is the apex of the cone?

1. North Pole
2. South Pole
3. Equator
4. 30th parallel

8-51. What is the difference between a gnomonic projection and a conic projection of the polar region?

1. In the gnomonic projection, the cone is cut and flattened out to form a map; whereas, the conic projection will appear as is
2. In the gnomonic projection, the points lying close together on either side of the meridian along which the cone is cut will be widely separated on the map; whereas, the conic projection will give a continuous and contiguous view of the area
3. In the conic projection, the cone is cut and flattened out to form a conformal map; whereas, the gnomonic projection will appear as is
4. In the conic projection, the cone is cut and flattened out to form a map; whereas, the gnomonic projection will appear as is

8-52. A Mercator projection is useful as a navigational chart due to which of the following factors?

1. Directional conformity only
2. Distance conformity only
3. Distance and directional conformity
4. Distance conformity and near directional conformity

8-53. Conformity for projections meets which of the following descriptions?

1. Meridians are parallel to each other and equidistant from parallels
2. Direction is relative to the point occupied
3. Distance is proportional to the location
4. Distance scale is the same for north and south as east and west

8-54. What is the disadvantage in using a Mercator projection for surveying purposes?

1. Mercator projections of the equatorial regions are impossible
2. Mercator projections provide relatively large-area maps that are conformal in distance only
3. The parallels are slightly curved. They are neither parallel nor precise
4. No distance scale can be consistently applied to all parts of the Mercator projections

8-55. A polyconic projection has near conformal direction due to what factor?

1. Largs-area maps are projected onto several cones and the spliced together
2. Small-area maps are projected onto several cones and built around a central meridian
3. Small-area maps are projected on more than one cone to have parallel meridians
4. Small-area maps are projected on more than one cone to have parallels perpendicular to meridians

8-56. Which of the following statements regarding great circles are true?

1. All parallels are great circles
2. All meridians are great circles
3. The equator is a great circle
4. Both 2 and 3 above

8-57. A nautical mile is equivalent to

1. 1 minute of longitude
2. 1 minute on an arc on a great circle
3. 1 minute of latitude
4. Both 2 and 3 above

8-58. What map projection is used as a base for the state coordinate systems for zones whose greater dimension is north-south?

1. Transverse Mercator projection
2. Lambert conformal conic projection
3. Polyconic projection
4. Gnomonic projection

ASSIGNMENT 9

Textbook Assignment: "Engineering and Land Surveys." Pages 10-1 through 10-29.

Learning Objective: Identify the types, purpose, and objectives of route surveys. Describe the general procedures used in route surveys.

9-1. A data-design survey obtains what type of information?

1. Preliminary data needed for planning a project only
2. Topographic information for highways only
3. Information for planning and designing a project
4. The same information as a route survey

9-2. What type of construction survey locates both horizontal and vertical control points?

1. Route
2. Layout
3. As-built
4. Preliminary

9-3. Route surveys may be used for which of the following purposes?

1. Above-ground utilities
2. Underground utilities
3. Roads
4. Each of the above

9-4. Which of the following elements of a route survey must always be performed?

1. Reconnaissance survey
2. Preliminary survey
3. Both 1 and 2 above
4. Final-location survey

9-5. The power transmission lines are being replaced. Which of the following surveys should you perform?

1. Reconnaissance
2. Preliminary
3. Both 1 and 2 above
4. Final location

9-6. The reconnaissance survey for electrical lines is performed by guidelines unique to that survey.

1. True
2. False

9-7. When performing a reconnaissance survey, you should perform what action first?

1. Study all the available maps of the area
2. Visit the proposed site
3. Prepare a topographic map
4. Locate existing utilities

9-8. When should the preliminary route survey be conducted?

1. Prior to selecting tentative routes
2. Before the reconnaissance survey
3. Just prior to the stakeout survey
4. After the tentative routes have been selected

9-9. When the route for the distribution line has been selected, a plan and profile are plotted. Which of the following elevations are shown?

1. Finish grade
2. Existing grade
3. Top of the poles
4. Both 2 and 3 above

9-10. When you stake pole locations, the guard stake for the offset hub contains which of the following information?

1. Finished elevation
2. Line elevation
3. Station number
4. Existing elevation

9-11. When laying out a route for towers, how are changes in direction handled?

1. In 30° increments
2. In 15° increments
3. In whatever manner possible
4. In a gradual curve in a succession of chords

Learning Objective: Recognize principles and practices associated with natural and artificial drainage.

9-12. What type of drainage system is the most desirable way to remove surface water?

1. Underground
2. Open ditch
3. Collection ponds
4. French drain

9-13. What does the term *runoff* mean in relation to drainage?

1. The amount of rainfall not absorbed
2. Water attempting to attain the lowest point due to gravity
3. Only the water collected in collection ponds
4. Water carried by the storm sewer system

9-14. Artificial drainage is used for what purpose?

1. To aid the natural drainage
2. To impede the natural drainage
3. To offset damage to the natural drainage due to construction
4. To improve the efficiency of the drainage ditches

9-15. The walls constructed at the outfall of a culvert are called

1. wing walls
2. catch basin walls
3. end walls
4. outlet walls

9-16. What appurtenance for a storm sewer system is located where trunk lines converge?

1. A manhole
2. A box
3. A junction box
4. A grate

9-17. Stationing for sewer pipe is laid out in what manner?

1. By the length of the pipe
2. By the horizontal distance covered
3. By the vertical distance covered
4. By any of the above methods

9-18. A plan and profile of a storm sewer line is developed after which of the following surveys?

1. Preliminary
2. Reconnaissance
3. Final-location
4. As-built

Learning Objective: Compute cross sections by resolving into triangles, by formula for three-level section, and by coordinates for a five-level or irregular section.

9-19. Area by resolution involves dividing the area into what type of figures for ease of calculation?

1. Irregular polygons
2. Trapezoids
3. Triangles
4. Both 2 and 3 above

9-20. The dimensions for computations of area by resolution are obtained in what manner?

1. By scale of the plot
2. By field measurements
3. Both 1 and 2 above
4. By interpolation

STA	ELEV	GRADE	LEFT		RIGHT
3	232.1	236.1	-1.2 / 17.4	-4.1 / 0.0	-7.0 / 29.0
2	229.1	234.7	-4.9 / 24.8	-5.6 / 0.0	-6.1 / 27.2

Figure 9A

IN ANSWERING QUESTIONS 9-21 THROUGH 9-29, REFER TO THE FIELD NOTES SHOWN IN FIGURE 9A. THE ROAD IS 30 FEET WIDE WITH 2:1 FILL SLOPES. (IN THE NOTES, CUT IS PLUS AND FILL IS MINUS.)

IN ANSWERING QUESTIONS 9-21 THROUGH 9-24, COMPUTE THE CROSS-SECTIONAL AREA AT STATION 2 + 00 BY USING THE FOLLOWING FORMULA:

$$A = \frac{W}{4}(h_l + h_r) + \frac{C}{2}(d_l + d_r)$$

9-21. What is the value of d_r?

1. 17.4 ft
2. 24.8 ft
3. 27.2 ft
4. 29.0 ft

9-22. What is the value of C?

1. -6.1 ft
2. -5.6 ft
3. -4.9 ft
4. -6.1 ft

9-23. What is the value of h_1?

1. 1.2 ft
2. 4.1 ft
3. 4.9 ft
4. 5.6 ft

9-24. What is the area of the cross section?

1. 166.8 ft
2. 228.1 ft
3. 373.7 ft
4. 475.6 ft

IN ANSWERING QUESTIONS 9-25 THROUGH 9-28, USE THE COORDINATES METHOD TO DETERMINE THE CROSS-SECTIONAL AREA AT STATION 3 + 00. THREE OF THE NEEDED COORDINATES ARE SHOWN IN THE NOTES; YOU WILL NEED THREE MORE COORDINATES. ONE OF THESE IS THE POINT OF ORIGIN THAT WILL BE AT CENTER-LINE FINISHED GRADE (COORDINATES 0/0). THE OTHER TWO COORDINATES ARE THE THREE ROAD EDGES TO THE LEFT AND TO THE RIGHT.

9-25. What is the coordinate of the left edge of the road?

1. 0/15
2. 0/-15
3. 1.2/17.4
4. 7.0/29.0

9-26. When you write down the coordinates beginning at the right edge of the road and go clockwise around the cross section, your first multiplication would be

1. -7[29 - 15]
2. -7[0 - 15]
3. -7[4.1 - 0]
4. -7[-17.4 - (-15)]

9-27. Continuing with the above procedure, the last computation would be

1. -4.1[29 - 14.4]
2. -4.1[-15 - 17.4]
3. -1.2[-15-0]
4. -1.2[-17.4 - (-15)]

9-28. What is the area of the cross section?

1. 67.3 sq ft
2. 85.3 sq ft
3. 156.6 sq ft
4. 313.2 sq ft

9-29. Using the average-end-area method, what is the volume between stations 2 + 00 and 3 + 00?

1. 69.0 cu yd
2. 712.4 cu yd
3. 1,424.8 cu yd
4. 2,429.6 cu yd

Learning Objective: Apply principles and procedures associated with the use of the mass diagram method to balance cut and fill as well as to limit haul distance in earthwork construction.

9-30. What is the importance of knowing the swell and compaction factors of the different types of soil?

1. Determining the different volumes of the soil in various conditions
2. Determining the shrinkage of the volume when excavated
3. Determining the loss of material when hauled
4. Determining the waste created during excavation

9-31. What is considered the limit of economic haul?

1. When the cost of the haul equals the cost of excavation
2. Any distance over 1,000 ft
3. One half of the free haul distance
4. When the cost of excavation equals twice the cost of the haul

9-32 . What distance is normally considered the free-haul distance?

1. 400 ft
2. 500 ft
3. 750 ft
4. 1,000 ft

9-33. When you prepare the table of cumulative yardage, how are the volumes obtained?

1. By scaling the cross sections
2. By area-by-formula method
3. By average end area and distance

9-34. The term *balance line* refers to the point on a mass diagram where

1. a cut becomes a fill
2. a fill becomes a cut
3. the haul limit is exceeded
4. the volume of fill equals the volume of cut

9-35. On a mass diagram, what term describes the section where a fill becomes a cut?

1. Minimum yardage
2. Maximum yardage
3. Balance line
4. Line of zero yardage

Learning Objective: Recognize the procedures of performing stakeout and as-built surveys for bridges, culverts, and underground utilities.

9-36. As-built surveys are performed to determine which of the following purposes?

1. Quantity of work left to complete
2. Points as actually constructed
3. Quantity of work actually completed
4. Both 2 and 3 above

9-37. At what point in construction should as-built data be collected?

1. At the completion of a section of the work
2. At the end of a job
3. At the completion of work for each sheet of the drawing
4. Each of the above

9-38. Work in place is based on what information?

1. Dollar value of material used
2. Quantity of planned work completed
3. Square footage of work surface
4. Man-hours expended

9-39. The grade of the ditch is measured at what point?

1. The shoulder of the ditch
2. The flow line of the ditch
3. The bottom of ditch
4. Both 2 and 3 above

9-40. When you stake out culverts, the detail of the work is based upon what factor?

1. Complexity of the culvert
2. Length of the culvert
3. Depth of the culvert
4. Location of the culvert

9-41. The ground support at the end of a bridge is called

1. a pier
2. an abutment
3. a bent
4. the bridge support

9-42. When a bridge does not align at right angles to the road or stream, this term is defined as

1. a near-side abutment
2. a far-side abutment
3. an askewed abutment
4. a misaligned abutment

IN ANSWERING QUESTION 9-43, REFER TO FIGURE 10-15 IN YOUR TEXTBOOK.

9-43. At the time the skew angle is turned the instrument is located at which intersection?

1. A girder center line and neat line of the abutment face
2. The railroad center line and the outside edge of the foundation
3. The railroad center line and neat line of the abutment face
4. A girder center line and the outside line of the foundation

9-44. When laying out the wing walls, what point(s) should you use?

1. The center line of the road
2. The faces of the abutments
3. The offset stakes
4. The wing wall guide stakes

9-45. A two pier bridge is to be built across a river. By triangulation, you are locating the sites of the piers. The base line should be of what minimum length to ensure well-proportioned triangles?

1. One half of the distance between the stakes establishing the bridge center line
2. Twice the distance between the stakes establishing the bridge center line
3. One half of the distance between the stakes establishing the piers
4. Twice the distance between the stakes establishing the piers

9-46. After the first pile is driven, a template is attached to it. What is the purpose of the template?

1. To assist in positioning other piles
2. To assist in positioning the guy lines
3. To aid in marking piles for length
4. To aid in measuring the distance between piles

9-47. Which pile should be located first?

1. The downstream pile
2. The pile farthest from shore
3. The pile closest to shore
4. The upstream pile

Learning Objective: Recognize principles and practices associated with stakeout and as-built surveys. Identify the purpose of a construction sheet.

9-48. When performing a stakeout for a sewer, you obtain the data for the stakeout from what source?

1. The utilities sheet of the drawing
2. The plan and profile
3. The grade sheet
4. The site plan

9-49. The alignment may be marked by which of the following methods?

1. Center-line hubs
2. Center-line stakes only
3. Offset hubs only
4. Offset hubs and offset stakes

9-50. When staking out a manhole that has a line running through it, you should place hubs that list what type of information?

1. The invert elevation of the inlet
2. The center line of the manhole
3. The invert elevation of the outlet
4. The invert elevation of all inlets and outlets

9-51. The cut for the sewer line is measured from what point in the field?

1. From the existing ground
2. From the top of the hub
3. From the top of the guard stake
4. From the top of the center-line stake

9-52. Battens serve what purpose in sewer stakeout construction?

1. Indicate the center line of the pipe
2. Brace the batter boards
3. Indicate the amount of cut
4. Set the pipe to the proper elevation

9–53. Sewer curb inlets are staked out with reference to

1. the sewer plan
2. the curbing plan
3. the street plan
4. the drainage plan

9-54. The use of a laser to control the alignment for excavating a trench and setting a pipe also eliminates the need for what other equipment?

1. Batter boards only
2. Batter boards and hubs
3. Hubs and strings
4. Batter boards and strings

9-55. A laser light beam consists of how many wavelengths of light?

1. One
2. Two
3. Three
4. Four

9-56. Which of the following aids assists the worker in controlling the invert elevation of the pipes being laid with a laser?

1. An L-shaped pole
2. The laser beam
3. Hubs
4. A string line and plumb bob

9-57. In relation to the incoming and outgoing ducts, where is the bottom of a manhole for an underground power system usually located?

1. About 6 in. below the inverts of the incoming and outgoing ducts
2. About 6 in. below the bottoms of the incoming and outgoing ducts
3. About 2 ft below the bottoms of the incoming and outgoing ducts
4. About 2 ft below the inverts of the incoming ducts

9-58. A construction sheet is prepared during a stakeout survey for what purpose?

1. To provide a permanent construction record
2. To provide a ready reference for computing earthwork
3. To record the surveyors' accomplishments
4. To preserve the description of the location and elevation of all hubs

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Learning Objective: Determine distances and locations for given airfield and waterfront surveys.

9-59. When laying out a runway, you must consider what factor?

1. Landing area
2. Parking apron
3. Direction of the prevailing wind
4. Drainage

9-60. What is the normal glide angle for most aircraft?

1. 1-ft vertical to 100-ft horizontal
2. 1-ft vertical to 75-ft horizontal
3. 1-ft vertical to 50-ft horizontal
4. 2-ft horizontal to 100-ft vertical

9-61. You are tasked to check for obstructions at the end of an airfield approach zone. What vertical angle should be used?

1. 1°
2. 1°8′45″
3. 1°50′
4. 2°

IN ANSWERING QUESTIONS 9-62 AND 9-63, REFER TO FIGURE 10-29 IN YOUR TEXTBOOK.

9-62. What is the distance between 9 and M?

1. 60 ft
2. 67 ft
3. 174 ft
4. 267 ft

9-63. What is the distance from set-up point E to pile No. 29?

1. $\left(\frac{150}{\tan 29°20'} - 200\right)(\tan 60°40') + 150$
2. $\left(\frac{200}{\tan 29°20'} - 150\right)(\tan 60°40') + 150$
3. $\left[\left(\frac{150}{\tan 29°20'} - 200\right) + (\tan 60°40')\right] + 150$
4. $\left(\frac{150 + 200 \tan 60° 40'}{\tan 29°20'}\right) + 150$

9-64. When locating piles by triangulation, you would normally locate how many piles?

1. As many as possible
2. Half of each bent
3. The two outside piles of each bent
4. Two

9-65. What type of notes, for each control station, should be maintained when shooting in piles?

1. Field notes
2. As-built drawings
3. Stakeout drawings
4. A pile location sheet

ASSIGNMENT 10

Textbook kAssignment: “Engineering and Land Surveys.” Pages 10-30 through 10-37 and “Horizontal and Vertical Curves.” Pages 11-1 through 11-21.

Learning Objective: Indicate the purpose, principles, and practical uses of land surveys. Identify the duties of the land surveyor.

10-1. What type of survey determines the boundaries and areas of a property?

1. Geodetic
2. Hydrographic
3. Land
4. Each of the above

10-2. The term *deed* is a legal instrument whereby a

1. surveyor is permitted to determine the boundaries of another person’s real property
2. person denies the use of his real property for a specific purpose to another person
3. person transfers his right to real property to another person
4. surveyor is permitted to occupy real property to determine the boundaries of other real property

10-3. All real estate deeds written in the United States must contain what information?

1. A leasehold
2. An easement
3. An accurate boundary description
4. A judge’s signature

10-4. When a particular land tract is defined by the lengths and bearings of its boundaries, the tract is described by what term?

1. Deed references
2. The coordinates of property corners
3. Blocks, tracts, or subdivisions
4. Metes and bounds

10-5. When magnetic bearings are read, which of the following information should be stated on the description of the land tract?

1. Computed azimuths
2. Declination and date of the survey
3. Plane coordinate of the corner monuments
4. Geodetic coordinates of the corner monuments

10-6. Modern surveying practice calls for a surveyor to supplement metes-and-bounds descriptions of boundaries with additional descriptive elements when available.

1. True
2. Fa1se

10-7. From which of the following points should a metes-and-bounds description start?

1. At an established monument
2. At a base line
3. At a neighboring boundary
4. At a bench mark

10-8. When property is transferred, what laws must be followed when the description and plan are recorded?

1. Federal
2. State
3. County
4. City

10-9. In preparing a metes-and-bounds description, you may add the bearings of the boundary lines for retracing the lines to which of the following measurements?

1. Azimuths
2. Back azimuths
3. Exterior angles
4. Interior angles

10-10. What agency publishes manuals that provide regulations on the subdivision of public lands?

1. Bureau of Public Highways
2. Bureau of Land Management
3. U.S. Coast and Geodetic Survey
4. Naval Facilities Engineering Command

10-11. The grid line that forms a right angle to the central meridian on a state grid system is known by what name?

1. X-axis
2. Y-axis
3. Southern grid basis line
4. Graticule

10-12. How are blocks, tracts, and subdivisions indicated on maps?

1. Tracts and subdivisions are numbered; whereas, blocks are named
2. Subdivisions are numbered; whereas, blocks and tracts are named
3. Tracts are numbered; whereas, blocks and subdivisions are named
4. Tracts and blocks are numbered; whereas, subdivision are named

10-13. Which of the following types of data is contained in the map books that are filed in the recorder's office?

1. Subdivision boundaries and locations
2. Map history
3. Bench mark locations
4. Listing of all the pertinent maps for a subdivision

10-14. During a boundary survey, which of the following information must be reported by the surveyor?

1. Correction to the original survey
2. Encroachments, easements, or any discrepancies
3. Man-hours spent on the survey
4. All errors made during the survey

10-15. What is a primary responsibility for a land surveyor making surveys on property boundaries?

1. To ensure the establishment of blocks, tracts, and subdivision
2. To meet the requests of the property owners
3. To prepare data that may be submitted as evidence for property disputes
4. To verify previous surveys so property may be transferred

10-16. How do land surveys differ from other types of surveys?

1. The surveyor may be required to make boundary decisions from conflicting evidence
2. More experience is required to perform land surveys
3. The accuracy required for land surveys is more precise
4. Methods for determining horizontal locations are different

10-17. What is normally the first step in performing a land survey?

1. Obtain copies of all boundary descriptions and records
2. Locate and study all boundary records
3. Locate in the field all existing boundaries
4. Relocate all existing monuments

10-18. Who is held responsible for inaccuracies in a survey?

1. The note keeper
2. The surveyor
3. The property owner
4. The original surveyor

10-19. Which of the following types of boundary markers should be avoided?

1. Tree
2. Edge of a stream
3. 2-in. by 2-in. hub
4. 2-in.-diameter steel pipe

10-20. One of the procedures for establishing property boundaries is the marking of points that have been destroyed since previous surveys.

1. True
2. False

10-21. Plats are drawn on what size sheet?

1. 9 in. x 12 in.
2. 11 in. x 14 in.
3. 17 in. x 22 in.
4. 19 in. x 24 in.

10-22. When an extensive drawing is printed in color on a plat, how, if at all, are wooded areas indicated when other important details are located in the woods?

1. The wooded area is shaded light green
2. The wooded area is indicated by a note in the margin of the plat
3. The words *WOODED AREA* are printed in black in the area of the woods
4. The wooded area would not be indicated because the marking would obscure the other details

10-23. What is the final step, required by law in some states, to be completed by the land surveyor before a plat is filed in the district land office?

1. Certification of the plat
2. Preparation of the property description
3. Preparation of the plat and a recheck of the accuracy
4. Approval of the field survey notes

10-24. On a plat of surveyed land, what is a departing property line?

1. A boundary line that has been moved or reestablished
2. A boundary line that is in dispute
3. A boundary line that can only be referenced to one permanent monument
4. A boundary line from one boundary through adjacent property

10-25. What information is required on a property plat?

1. Name of all adjacent property owners
2. Grid lines
3. Surveyor’s certification statement
4. Area of the enclosed property

10-26. By which of the following methods would the corners of a large naval station normally be located for a boundary survey?

1. Transit-tape survey
2. Triangulation
3. Geodetic survey
4. Traversing

10-27. The precision of a land survey is determined on the basis of which of the following factors?

1. Experience of the surveyor
2. Value of the property
3. Types of structures that will be constructed near the boundary lines
4. Both 2 and 3 above

Learning Objective: Recognize terms associated with horizontal curves; identify types and elements of horizontal curves; identify some basic formulas associated with simple computation.

10-28. A highway is composed of a series of curves and straight lines. The term for these straight lines is

1. traverses
2. radii
3. tangents
4. center lines

10-29. What is the principle considera-tion in curve design?

1. Speed of the highway
2. Degree of curvature
3. Length of the radius
4. Both 2 and 3 above

10-30. What type of curve consists of two joined circular curves that have radii on the same side of the highway?

1. Simple
2. Compound
3. Spiral
4. Reverse

A. Degree of curve

B. Point of curve

C. External distance

D. Central angle

Figure 10A

IN ANSWERING QUESTIONS 10-31 THROUGH 10-36, SELECT FROM FIGURE 10A THE ELEMENT OF A CURVE DESCRIBED BY THE ITEM. INDIVIDUAL RESPONSES MAY BE USED MORE THAN ONCE OR NOT AT ALL.

10-31. The angular value that is equal to the intersecting angle (I):

1. A
2. B
3. C
4. D

10-32. The angle formed by two radii that subtend an arc of 100 feet:

1. A
2. B
3. C
4. D

10-33. A point on the curve:

1. A
2. B
3. C
4. D

10-34. The angle formed by the radii of a simple curve:

1. A
2. B
3. C
4. D

10-35. This determines the flatness or sharpness of a highway:

1. A
2. B
3. C
4. D

10-36. This bisects the interior angle at the point of intersection:

1. A
2. B
3. C
4. D

10-37. For a degree of curvature of 1°, the radius is 5,729.58 ft. Which of the following equations could be used to derive this value?

1. $\frac{D}{360} = \frac{Arc}{2\pi R}$

2. $2\pi R = 36{,}000$

3. $\frac{1}{360} = \frac{100}{2\pi R}$

4. Each of the above

Learnning Objective: Recognize correct procedures and perform mathematical computations to solve simple horizontal curve situations.

10-38. To solve for the tangent distance, you must know what information?

1. Point of tangency
2. Point of curvature
3. Central angle and radius
4. Each of the above

10-39. You must know the degree of the curve to solve for which of the following information?

1. Chord distance
2. Curve distance
3. Tangent distance
4. External distance

10-40. When calculating the length of the curve using the chord definition, you obtain a value sightly less than the true length of the curve.

1. True
2. False

10-41. What is the recommended procedure for laying out a curve?

1. Swing the arc with a tape
2. Set up a transit at the PI and turn the interior angles
3. Set up a transit at the PC and turn the interior angles
4. Set up the transit at the PC and turn deflection angles

10-42. The degree of curve required for the layout of a road section is 20°. When you lay out this curve, what chord length should you use to minimize the difference between arc and chord distances?

1. 10 ft
2. 25 ft
3. 50 ft
4. 100 ft

IN ANSWERING QUESTIONS 10-43 THROUGH 10-52, YOU ARE TO LAY OUT A HORIZONTAL CURVE BY ARC DEFINITION, USING THE FOLLOWING DATA:

PI = Sta. 16 + 24.60
I = 60°
D = 8°

10-43. How long is the radius(R) for the curve?

1. 708.20 ft
2. 716.20 ft
3. 720.20 ft
4. 728.20 ft

10-44. What is the plus station at the *PC?*

1. 12 + 11.10
2. 12 + 12.60
3. 20 + 38.10
4. 20 + 40.20

10-45. What station should you mark the stake at the *PT?*

1. 23 + 74.60
2. 23 + 46.10
3. 19 + 61.10
4. 19 + 51.10

10-46. What is the value of the external distance *(E)?*

1. 108.10 ft
2. 110.80 ft
3. 112.80 ft
4. 114.60 ft

10-47. What is the value of the middle ordinate *(M)?*

1. 75.95 ft
2. 82.55 ft
3. 89.85 ft
4. 95.95 ft

10-48. How long is the long chord *(LC)?*

1. 716.20 ft
2. 718.20 ft
3. 720.10 ft
4. 722.10 ft

10-49. What is the size of the deflection angle you would use for a 50-foot chord?

1. 1°30′
2. 2°00′
3. 2°30′
4. 3°00′

10-50. With a chord length of 50 feet, what is the distance from the *PC* to the first point on the curve?

1. 11.10 ft
2. 25.40 ft
3. 38.90 ft
4. 50.00 ft

10-51. The deflection angle used for the distance above is

1. 1°30′
2. 1°33′
3. 1°35′
4. 1°45′

10-52. What is the deflection angle, d_2, for the last subchord to the PC?

1. 0°15′
2. 0°25′
3. 0°27′
4. 0°30′

10-53. The degree of curve and the intersecting angle are both given in degrees and minutes. Which of the following actions should you take during the computation to maintain the degree of accuracy?

1. Round off angles to the nearest tenth of a degree
2. Round off angles to the nearest hundredths of a degree
3. Convert angles to minutes for computations
4. Convert angles to seconds for computations

10-54. The first step in staking out a simple curve is to set the instrument up at what point?

1. *PC*
2. *PI*
3. *PT*
4. Midpoint

10-55. As a check during the stakeout of a simple curve, the angle from the *PI* to the *PT* is measured while the instrument is still at the *PC.* The angle should equal which of the following values?

1. One half of the central angle
2. One half of the intersecting angle
3. The total of the deflection angles
4. Each of the above

10-56. What is gained by using the “backing-in” method of staking out a horizontal curve?

1. Fieldwork is accomplished much faster
2. Curve distortion is minimized by applying the error at the center of curve
3. Fewer instrument setups are needed
4. Deflection angles can be turned more accurately

Learning Objective: Recognize terms associated with vertical curves; identify types and elements of vertical curves.

10-57. What is a vertical curve at the bottom of a hill?

1. Summit curve
2. Oververtical curve
3. Sag curve
4. Compound curve

10-58. A constant slope between curves is known by what term?

1. Grade
2. Grade tangents
3. Gradient
4. Each of the above

10-59. Vertical curves are usually what shape?

1. Parabolic
2. Circular
3. Elliptical
4. Hyperbolic

10-60. In a vertical curve system, the point of vertical tangency is located at what point?

1. Where the curve begins
2. Where the curve ends
3. Where the grade tangents intersect
4. At any point on the tangent

10-61. Vertical curves are used at locations other than the top or bottom of a hill.

1. True
2. False

Learning Objective: Recognize and use the fundamental principles of symmetrical and unsymmetrical curve computation; recognize basic procedures associated with checking computation by plotting, using a profile work sheet, and making a field stakeout of vertical curves.

10-62. What factor makes a curve symmetrical?

1. g_1 equals g_2
2. 1_1 equals 1_2
3. Both 2 and 3 above
4. G equals zero

10-63. Usually , the *PVC* and *PVT* are designed to be set at what location along the survey?

1. At full stations or half stations
2. At 25-foot intervals
3. Points on the same parabola
4. Any of the above

10-64. Given a *PVC* elevation of 100 ft, a first slope of +4%, a second slope of +2%, and L = 400 ft. On a symmetrical curve, what is the elevation of the *PVT?*

1. 107 ft
2. 112 ft
3. 116 ft
4. 120 ft

10-65. Given a *PVC* elevation of 100 ft, a first slope of+ 4%, a second slope of +2%, and L = 400 ft. What is the value of the middle vertical offset?

1. -0.5 ft
2. -1.0 ft
3. -1.5 ft
4. -2.0 ft

10-66. The middle vertical offset on a symmetrical vertical curve is 2 ft and *L* = 400 ft. What is the value of the vertical offset at the first station ahead of the *PVC?*

1. 2.0 ft
2. 1.5 ft
3. 1.0 ft
4. 0.5 ft

IN ANSWERING QUESTIONS 10-67 AND 10-68, USE THE FOLLOWING INFORMATION.

PVC IS AT STA. 39 + 00 ELEV = 100.00 FT
L = 1000 FT g_1= +10% g_2 = -2%

10-67. The turning point for this curve will be located at what station?

1. 47 + 57.8
2. 44 + 24.5
3. 40 + 91.2
4. 40 + 24.5

10-68. The elevation of the turning point is

1. 101.23 ft
2. 101.67 ft
3. 103.33 ft
4. 105.00 ft

10-69. When computing the elevations of symmetrical vertical curves, you can check the accuracy of your computation through a derived constant value for the

1. second differences in elevations of successive stations
2. vertical offsets of successive stations
3. second differences in elevations of adjacent stations
4. *e* value at successive stations

IN ANSWERING QUESTIONS 10-70 and 10-71, YOU ARE LAYING OUT A 1,500-FOOT VERTICAL CURVE. THE ELEVATION AT THE *PVC* IS 326.21 FT. THE *PVC* IS LOCATED AT STATION 29 + 00.

g_1= -8% g_2 = +4% 1_l = 500 ft

10-70. The middle vertical offset is

1. 6 ft
2. 10 ft
3. 16 ft
4. 20 ft

10-71. The turning point is at station

1. 29 + 31.3
2. 34 + 31.3
3. 38 + 31.3
4. 44 + 31.3

10-72. Vertical curve computation should be checked by plotting the curve on an exaggerated scale in which the vertical scale is larger than the

1. vertical offset
2. horizontal scale
3. ship’s curve
4. stationing

10-73. The original tracing of a road profile will contain which of the following information?

1. Tangent elevations
2. The vertical offsets
3. Length of the curve
4. *x/1* ratio

10-74. The procedure used to set grade stakes for a *POVC* differs greatly from the procedure used to set grade stakes for a point on a grade tangent.

1. True
2. False

ASSIGNMENT 11

Textbook Assignment: "Electronic Surveying Equipment." Page6 12-1 through 12-8. "Material Testing." Pages 13-1 through 13-28.

Learning Objective: Display a basic familiarity with the electronic distance measurement (EDM) system by identifying related processes and devices.

11-1. In the EDM system, a linear distance can be computed by multiplying the time it takes a flash of light to travel a given distance by the velocity of the light.

1. True
2. False

11-2. Electronic distance meters operate using which of the following methods?

1. Microwaves
2. Light Waves
3. Both 1 and 2 above
4. Refracted light

11-3. Which of the following instruments originates and transmits the signal?

1. Sending
2. Remote
3. Receiver
4. Geodimeter

11-4. What advantage, if any, does the electromagnetic instrument have over the electro-optical instrument?

1. Electromagnetic EDMs do not require an unobstructed line
2. Electromagnetic EDMs can be used in fog or inclement weather
3. Electromagnetic EDMs require only one instrument
4. None

11-5. What instrument, if any, is used with an EDM to measure the direction of the line?

1. A theodolite
2. A transit
3. A direct reading level
4. None

11-6. You have used separate setups for measuring the vertical angle and the distance. Besides the h.i. of the instruments, which of the following data is required to reduce the slope distance?

1. The temperature
2. The target h.i. only
3. The reflector h.i.
4. Both 2 and 3 above

11-7. Which of the following positioning systems utilizes satellites?

1. Initial positioning system
2. Electronic positioning system
3. Doppler positioning system
4. Each of the above

11-8. Which, if any, of the following groups contain data storage units?

1. Computerized theodolite and EDM
2. Combined theodolite and EDM
3. Electronic tachometers
4. None of the above

11-9. What equipment is available to the NMCB as augment equipment for high-order precision surveying?

1. Computerized theodolite
2. Combined theodolite and EDM
3. Doppler system
4. Electronic tachometers

11-10. The laser light beam consists of what number of color(s) of the color spectrum?

1. One
2. Two
3. Three
4. Four

11-11. The single-beam laser does NOT emit a visible light beam and cannot be used for alignment.

1. True
2. False

11-12. A rotating laser level is self-leveling within what range?

1. 20 seconds
2. 8 degrees
3. 16 degrees
4. 90 degrees

11-13. Which of the following advantages applies when using a laser plane?

1. Requires less time to take the same number of rod readings
2. Does not require an instrumentman for shooting a line
3. Uses a laser beam instead of a string line
4. Each of the above

Learning Objective: Recognize the procedures used to perform various soils tests and identify the apparatus and equipment used for each procedure.

11-14. Compaction improves which of the following soil properties?

1. Strength
2. Flexibility
3. Moisture content
4. Cohesiveness

11-15. As the moisture content is increased, the density will also continue to increase.

1. True
2. False

11-16. What effect does an increased compactive effort have on the density and OMC?

1. Increases both the OMC and the density
2. Increases the density and decreases the OMC
3. Increases the OMC and decreases the density
4. Decreases both the OMC and the density

11-17. What is the volume of the Proctor mold?

1. 1 cubic foot
2. 1/3 cubic foot
3. 3 cubic foot
4. 1/30 cubic feet

11-16. The compaction tamper has a drop of what distance?

1. 10 inches
2. 14 inches
3. 18 inches
4. 24 inches

11-19. When you prepare your samples for the compaction test, the moisture content of each sample is increased by what increment?

1. 1%
2. 2%
3. 1 1/2%
4. 2 1/2%

11-20. The objective of the compaction test is to determine what factor?

1. The OMC
2. The maximum density
3. The compactive effort required
4. The soil weight

11-21. During construction, what check is performed to test the compactive effort?

1. Moisture test
2. CBR test
3. Soil compaction test
4. Density test

11-22. When determining in-place density, which of the following methods should you use?

1. Penetration method
2. Load-bearing method
3. Nuclear moisture-density meter method
4. Hydrometer method

11-23. Before you perform the sand-displacement method for in-place density, certain calibration must be performed. Which of the following calibration must be completed?

1. Determine the jar volume
2. Determine the sand density
3. Determine the volume of the cone, template, and surface irregularities
4. Each of the above

11-24. What is the depth of the hole for the sand-displacement method?

1. 5 inches
2. 6 inches
3. 3 inches
4. 4 inches

11-25. A soil-sample container must be kept closed to prevent what problem?

1. Absorption of moisture
2. Sample loss
3. Moisture loss

11-26. What method is recommended to determine the moisture content of a sample?

1. The alcohol burn-off method
2. The Speedy moisture tester method
3. The oven-dried method
4. The air-dried method

11-27. The nuclear moisture-density meter determines the moisture in the soil by what method?

1. Measures the hydrogen concentration in the soil
2. Counts the gamma rays emitted
3. Measures the moisture evaporated by radiation
4. Measures oxygen in the soil

11-28. Before operating the nuclear moisture-density meter, you must receive specialized training and obtain certification.

1. True
2. False

11-29. The California bearing ratio test is what type of test?

1. Density
2. Load bearing
3. Moisture
4. Soil analysis

11-30. Procedures for sample preparation for the CBR test are found in what publication?

1. MIL-STD-621A
2. NAVFAC MO-330
3. ASTM D 422
4. NAVFAC P-437

11-31. Which of the following tools are part of the loading-press assembly?

1. CBR mold
2. Tripod attachment
3. Surcharge weight
4. Soaking tank

11-32. How many successive tests are performed for the CBR test?

1. Five
2. Two
3. Three
4. Four

11-33. The mold and sample must be soaked in water for what minimum number of days?

1. 5
2. 2
3. 3
4. 4

11-34. After you remove the sample from the water, how long should it drain before the penetration test is performed?

1. 15 minutes
2. 2 hours
3. 8 hours
4. 24 hours

11-35. When performing the penetration test, how do you obtain the total load?

1. Multiply the dial reading by the proving-ring constant
2. Divide the unit load by three
3. Multiply the corrected dial reading by the proving-ring constant
4. Multiply the penetration by the standard load

11-36. When determining the CBR values, what penetration value should you normally use?

1. 0.1 inch
2. 0.2 inch
3. 0.3 inch
4. 0.4 inch

11-37. When is soil considered susceptible to frost?

1. When the OMC is greater than 4%
2. When the soil contains 3% or more by weight of particles smaller than 0.020 mm in diameter
3. When the soil contains 3% or more by weight of particles passing a No. 200 sieve
4. When the OMC is between 8% and 12%

11-38. What publication(s) should you refer to for the proper procedures of hydrometer analysis?

1. ASTM D 422
2. NAVFAC MO-330
3. Both 1 and 2 above
4. NAVEDTRA 12540

11-39. Samples for the hydrometer analysis must pass through

1. a No. 10 sieve
2. a No. 50 sieve
3. a No. 100 sieve
4. a No. 200 sieve

11-40. After you make the soil-water slurry, how long should the sample soak?

1. 30 minutes
2. 6 hours
3. 12 hours
4. 16 hours

11-41. Readings taken with the hydrometer require correction due to which of the following factors?

1. Temperature different from the standard
2. The effect of the dispersing agent on the liquid density
3. Difficulty in reading the meniscus
4. Each of the above

Learning Objective: Recognize the types of cement and the tests used to identify them.

11-42. Cement is another name for concrete.

1. True
2. False

11-43. Portland cement is a mixture of clay and limestone of which a certain percentage must pass through a No. 200 sieve?

1. 80%
2. 90%
3. 95%
4. 100%

A.	Type I	E.	Type V
B.	Type II	F.	Type IP
C	Type III	G.	Type IS
D.	Type IV	H.	Air-entrained

Figure 11A

IN ANSWERING QUESTIONS 11-44 THROUGH 11-47, SELECT FROM FIGURE 11A THE TYPE OF CEMENT THAT IS THE CORRECT RESPONSE. ALL INDIVIDUAL RESPONSES MAY NOT BE USED.

11-44. This type of cement is normally used is cold-weather construction.

1. B
2. C
3. D
4. F

11-45. Which of the following types of cement is not available as air entrained?

1. C
2. D
3. F
4. G

11-46. This type of cement is considered all-purpose and is used in ordinary construction.

1. A
2. E
3. G
4. H

11-47. This type of cement produces concrete with less strength than concrete made with portland cement but the workability is better.

1. D
2. E
3. F
4. G

11-48. What type of cement is used to prevent staining or darkening of finished concrete?

1. Waterproofed cement
2. Air-entrained cement
3. Pozzolan cement
4. White cement

11-49. What is the maximum time the hardening test should take to complete?

1. 6 hours
2. 10 hours
3. 16 hours
4. 24 hours

Learning Objective: Identify types of water used in concrete, the impurities found in the water, and the effects the impurities have on the concrete. Identify the types and requirements of aggregate and identify the tests used on the aggregates.

11-50. Which of the following purposes does water serve in the concrete mix?

1. Starts the hydration
2. Changes the hydration process
3. Retards the hydration
4. Reduces workability

11-51. What effect does organic material have on the hydration process?

1. Prevents a full chemical reaction
2. Prevents cement adherence
3. Contributes to concrete deterioration
4. Each of the above

11-52. When seawater is used to mix concrete, what compensation must be made to maintain compressive strength?

1. Increase the water-cement ratio
2. Decrease the water-cement ratio
3. Use Type III cement
4. Use waterproofed cement

11-53. Aggregate should have what shape to increase workability?

1. Rounded
2. Subrounded
3. Subangular
4. Angular

11-54. What is the maximum size a coarse aggregate should be in a heavily reinforced slab, 7 inches thick?

1. 1 inch
2. 2 inches
3. 1 1/2 inches
4. 2 1/2 inches

11-55. To remove silts, clays, and organic material in the aggregate to be used in a concrete mix, which of the following actions should you take?

1. Drying
2. Burning
3. Washing
4. Heating

11-56. What is the recommended amount for the sampling of a stockpile that is used for the tests?

1. The amount needed
2. Twice the amount needed
3. Three times the amount needed
4. Four times the amount needed

11-57. What is the name of the value that gives a relative measure of the proportions of fine and coarse particles in an aggregate?

1. Fineness module
2. Gradation of the sample
3. Aggregate grading
4. Gradation limits

11-58. When you test the aggregate for soundness, what test, other than the freeze-thaw test, may be performed?

1. Fines test
2. Color test
3. Salt test
4. Wash test

11-59. What is the recommended amount of fines in concrete to achieve good workability?

1. 0.0 to 1.0 percent
2. 1.1 to 2.9 percent
3. 3.0 to 5.0 percent
4. Above 5 percent

11-60. When the percentage of fines in a sample is 5 percent and the dry weight is 1,995 grams, what is the original dry weight of the sample?

1. 1,895 grams
2. 2,005 grams
3. 2,095 grams
4. 2,100 grams

11-61. When you test for undesirable lightweight material, what is the size of sieve used for coarse aggregate?

1. 1/4 inch
2. No. 4
3. No. 10
4. No. 50

11-62. When do you perform the test for clay lumps?

1. Before sieve analysis
2. After sieve analysis
3. After washing
4. Both 2 and 3 above

11-63. You have performed the color test and determined that organic material is present in the sand. Which of the following options should be taken?

1. Find a replacement sand
2. Wash the existing sand
3. Use a lower water-cement ratio
4. Each of the above

11-64. When you are determining bulk specific gravity, the aggregate should be in what condition?

1. Oven-dried
2. Air-dried
3. Super-saturated
4. Saturated, surface-dried

11-65. Absorption represents what moisture content of the aggregate?

1. The surface moisture
2. The aggregate at SSD
3. The aggregate super-saturated
4. The quantity of water required for the mix

11-66. What is the recommended length of time to soak your sample for the specific gravity test?

1. 6 hours
2. 12 hours
3. 18 hours
4. 24 hours

11-67. What procedure assists you in determining when fine aggregate has reached SSD?

1. The wet shaking test
2. The water-absorption cone and tamper method
3. The pycnometer
4. The Atterberg limits test

11-68. The oven-dried fines sample weighed 485 grams. What was the percentage of absorption?

1. 1.5%
2. 2.0%
3. 2.5%
4. 3.0%

Learning Objective: Identify admixtures used for concrete and the effects they have on concrete characteristics.

11-69. What results are obtained by adding accelerators to concrete?

1. Higher rate of heat production
2. Slows the hydration process
3. High-early-strength concrete with a lower strength
4. Full hydration does not occur

11-70. The workability of concrete is governed by the amount of aggregate in the mix. When the aggregate cannot be reduced, what admixture should you use?

1. Calcium chloride
2. Fly ash
3. Pozzolan
4. Each of the above

11-71. Dense concrete is required in what type of concrete work?

1. Prestressed structures
2. Overhead pours
3. Load-bearing walls
4. Runways

11-72. The critical period in the curing process of concrete occurs at what time frame?

1. From the day of placement through the 10th day
2. From the day after placement through the 10th day
3. From the day of placement through the 14th day
4. From the day of placement through the 28th day

11-73. What is the ideal temperature ranges for concrete work?

1. Below 35°
2. Between 35° and 50°
3. Between 55° and 70°
4. Between 70° and 90°

11-74. After the initial set is attained, which of the following actions may be taken to keep the hydration process in action?

1. Apply a curing compound
2. Cover the concrete with burlap or plastic
3. Keep the forms wet
4. Apply water directly to the surface

11-75. In concrete work, any loss of moisture during the curing process by seepage or evaporation prevents complete hydration and the development of optimum strength, as well as watertightness.

1. True
2. False

ASSIGNMENT 12

Textbook Assignment: “Material Testing.” Pages 13-29 through 13-51.

Learning Objective: Identify tests required for concrete construction quality control. Identify procedures used for preparing and performing these tests.

12-1. What is the purpose of the slump test?

1. To measure the water content
2. To check the cement content
3. To check the workability of the mix
4. To check aggregate cohesiveness

12-2. Which of the following effects are associated with excessive bleeding of the concrete mix?

1. Increased water-cement ratio in the mix
2. Increased water-cement ratio near the surface
3. A weaker lower layer but increased surface durability
4. Lack of water migration and slower hydration

12-3. What is the desired quantity of air for an air-entrained mix?

1. 4.0 to 7.5 percent of the cement
2. 4.0 to 7.5 percent of the water
3. 4.0 to 7.5 percent of the total aggregate
4. 4.0 to 7.5 percent of the total mix

12-4. When you are determining the unit weight, what is the purpose of tapping the side of the sample container after rodding?

1. To allow the sample to settle similar to actual placement
2. To remove air pockets
3. To cause segregation of the aggregate
4. To determine the air content by the weight differential

12-5. What is the minimum number of cylinders required for a compressive strength test?

1. One
2. Two
3. Three
4. Four

12-6. The diameter of the test specimen for compressive strength is determined to the nearest

1. 0.001 inch
2. 0.05 inch
3. 0.01 inch
4. 0.1 inch

12-7. The test load is applied to the cylinder at what constant rate?

1. 10 to 20 psi
2. 20 to 40 psi
3. 30 to 50 psi
4. 20 to 50 psi

12-8. When the flexural-strength test is performed, the load is applied to what portion of the beam?

1. Sides
2. Ends
3. Top
4. Bottom

12-9. When you perform the flexural-strength tests for a mix design, how many samples should be broken at 7 days?

1. Five
2. Two
3. Three
4. Four

12-10. If the beam sample is too rough for a proper seat to be formed by the load surface, what action should be taken?

1. Grind the surface
2. Use another beam
3. Cap the surface
4. Shift the beam to achieve proper contact

12-11. An average width and depth should be obtained before performing the flexural-strength test.

1. True
2. False

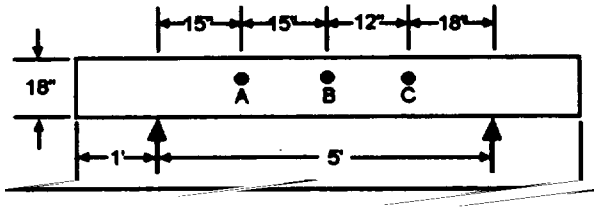

Figure 12A

IN ANSWERING QUESTIONS 12-12 THROUGH 12-14, REFER TO FIGURE 12A.

12-12. What is the modulus of rupture for the beam if P = 4,000 pounds, b = 6 inches, and the fracture occurs at point B?

1. 61.6 psi
2. 123.5 psi
3. 172.8 psi
4. 379.6 psi

12-13. What is the modulus of rupture for the beam if P = 6,000 pounds, b = 4 inches, and the fracture occurs at point C?

1. 250.0 psi
2. 277.8 psi
3. 388.9 psi
4. 583.3 psi

12-14. If the beam ruptures at point A under a load of 5,000 pounds, the test results should be computed by which, if any, of the following formulas?

1. $R = \frac{P}{bd^2}$
2. $R = \frac{3Pa}{bd^2}$
3. $R = \frac{Pa}{bd^2}$

4. None, it should be rejected

12-15. The flexural strength of a test beam is 625 pounds per square inch. What is the approximate compressive strength of the concrete?

1. 3,700 psi
2. 3,800 psi
3. 3,900 psi
4. 4,000 psi

12-16. The rebound method uses a hammer to test what strength of the concrete?

1. Compressive
2. Shear
3. Flexural
4. Load bearing

12-17. The pullout-test method is correlated with compressive strength to determine what information?

1. In-place strength
2. Flexural strength
3. Load-bearing capacity
4. Curing time

Learning Objective: Identify the materials used to produce bituminous pavement. Identify characteristics and uses of bitumens.

12-18. Coarse aggregate materials used in bituminous pavement are stone or gravel retained on what sieve?

1. No. 4
2. No. 8
3. No. 10
4. No. 40

12-19. Fine rock dust that passes the No. 200 sieve which is used in a paving mix is known by what name?

1. Silica
2. Mineral filler
3. Limestone dust
4. Mineral dust

12-20. Normally, bituminous mixtures contain what percentage of aggregate by weight?

1. 80%
2. Between 85% and 90%
3. 90% or more
4. Not less than 95%

12-21. Tars are obtained from the distillation of what material?

1. Bituminous cement
2. Crude petroleum
3. Bituminous coal
4. Creosote

12-22. Which of the following materials is a residue in the distillation of crude oil?

1. Gasoline
2. Fuel oils
3. Kerosene
4. Lubricating oi1s

12-23. Which of the following asphalt petroleum numbers correspond to a hard relative consistency?

1. 9
2. 7
3. 3
4. 00

12-24. Asphalt dissolved in petroleum products is known as

1. cutterstock
2. emulsified asphalt
3. road tar
4. cutback asphalt

12-25. What solvent is used to produce medium-curing cutback?

1. Gasoline
2. Kerosene
3. Naphtha
4. Fuel oil

12-26. What is the upper viscosity limit of an asphalt bitumen classified as RC-250?

1. 125
2. 250
3. 500
4. 750

12-27. RTCB is manufactured only in the viscosity grades of 5 and 6. RTCB is the designation for

1. coal-tar cutback that contains no road tar distillates
2. hot-tar cutback that contains road tar distillates
3. road-tar cutback that contains no coal tar distillates
4. road-tar cutback that contains coal tar distillate

12-28. Which of the following factors determine the selection of bituminous material to be used in a pavement?

1. Type of pavement
2. Climatic conditions
3. Availability of equipment
4. Each of the above

12-29. Which of the following bitumens would be the recommended surface for an airfield refueling point?

1. Road tar
2. Asphalt cement
3. Asphalt emulsion
4. Asphalt cutback

12-30. Which of the following bitumens has a very limited storage time and should not be exposed to freezing temperatures?

1. RTCB
2. Asphalt cement
3. Asphalt emu1sion
4. RC asphalt cutback

Learning Objective: Identify practices and procedures associated with field and laboratory identification of unknown bituminous materials.

12-31. What test do you perform to determine if a bitumen is an asphalt, an emulsion, or a tar?

1. Volubility
2. Smear
3. Pour
4. Penetration

12-32. Asphalt cement can be distinguished from asphalt cutback by means of the what test?

1. Field penetration
2. Pour
3. Volubility
4. Stone coating

12-33. During the field test, a pencil point penetrates slowly a sample of asphalt cement with little difficulty. What is the grade of the asphalt cement?

1. 0-40
2. 40-85
3. 85-150
4. 150-300

12-34. What is the probable identity of an asphalt cutback sample that pours like molasses and was determined to be tacky as the result of the smear test?

1. RC-800
2. MC-800
3. SC-800
4. AC-800

12-35. What type of cutback is indicated when a sample gives off a strong odor of kerosene when heated?

1. Rapid curing
2. Medium curing
3. Slow curing

12-36. When you mix an emulsion with damp sand, what action identifies the emulsion as a rapid-setting type?

1. Readily mixes with the sand
2. Partially coats the sand
3. Does not mix with the sand
4. A solidifying of the mixture will occur

12-37. What test is used to distinguish RTCB from RT-7?

1. Pour
2. Smear
3. Heat-odor
4. Solubility

12-38. Laboratory tests serve which of the following purposes?

1. They establish safe handling procedures
2. They provide positive identification of bituminous material
3. They establish a working mix design
4. Each of the above

12-39. Composition of a bitumen is determined by which of the following methods?

1. Matching a sample of the bitumen with previously marked samples
2. Determining the elasticity of the sample
3. Both 1 and 2 above
4. Heating the sample to analyze the breakdown of the bitumen

12-40. Which of the following types of equipment may be used to determine the flash point of a sample of SC-800?

1. Tag open-cup equipment
2. Cleveland open-cup equipment
3. Both 1 and 2 above
4. Copper water bath apparatus

12-41. *Flash point* is defined as the temperature at which

1. the surface of the material ignites without the use of a test flame
2. the entire surface of the material produces a blue flame
3. the test flame produces a distinct flash on the surface
4. the surface of the material remains ignited without the use of a test flame

12-42. The results of the penetration test should be the average of

1. no more than three tests whose values differ by three points or less between maximum and minimum
2. not less than three tests whose values differ by four points or less between maximum and minimum
3. two tests regardless of the difference
4. not less than four tests whose values differ by three points or less between maximum and minimum

12-43. In addition to grade determination, the penetration test can be useful for which of the following purposes?

1. Determining the effect of age and weathering of existing pavement
2. Detecting overheating in existing pavement
3. Determining the effect of age on asphalt in storage tanks
4. Each of the above

12-44. What minimum percentage of the mineral filler should normally pass the No. 200 sieve?

1. 50%
2. 65%
3. 85%
4. 100%

12-45. It is determined that the original oven-dried weight of a paving mix aggregate sample is 532 grams. After it has been thoroughly washed and oven-dried, the sample weighs 474 grams. What is the percentage of mineral dust in the sample?

1. 8.2%
2. 10.9%
3. 12.2%
4. 24.4%

12-46. You are to determine the specific gravity of an aggregate that has been retained on the 3/8-inch sieve. What equipment do you use?

1. Pycnometer
2. Cleveland open-cup
3. Tag open-cup
4. Dunagan apparatus

12-47. Mix design tests are used to determine which of the following data?

1. The optimum bitumen content
2. The optimum aggregate content
3. The gradation requirement
4. Each of the above

12-48. What sieves should you use to divide the aggregate sample before performing the sieve analysis to determine the combined gradation for the test blend?

1. Numbers 4, 8, and 80
2. Numbers 4, 8, 80, and 200
3. Numbers 8, 80, and 200
4. Numbers 8, 40, 80, and 200

12-49. What is the recommended number of compaction blows on a compaction sample for a primary road?

1. 50
2. 75
3. 100
4. 200

12-50. When mixing and compacting an aggregate bitumen sample, you compact the sample with a tamper for what purpose?

1. To prepare the sample for a cohesiveness test
2. To test the sieve analysis
3. To produce the same density that will be attained under normal traffic
4. To test the moisture retention

12-51. When you are determining the density of porous samples, what method is recommended to prevent erroneous results due to absorption?

1. Super-saturate the material before obtaining the unit weight
2. Coat the sample with wax to seal all the voids
3. Oven-dry the sample, weigh it, and then super-saturate

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